WORK PLAN

FOR

FORMER ANGELES CHEMICAL COMPANY FACILITY
8915 SORENSEN AVENUE
SANTA FE SPRINGS, CALIFORNIA

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JULY 18, 2001

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1.0) INTRODUCTION

Blakely Environmental Investigations, Inc. (BEII) was contracted by Greve Financial Services, Inc. ((310) 753-5770) to prepare a work plan in order to determine the lateral extent of volatile organic compound (VOC) in soil identified by SCS to the north and soil vapors along the southern boundary of the former Angeles Chemical Co. facility located at 8915 Sorensen Avenue, Santa Fe Springs, California (See Figure 1, Site Location Map). The work plan details the proposed work as requested by the regulatory lead agency, the Department of Toxics Substance Control (DTSC).

2.0) SITE LOCATION AND HISTORY

The site is approximately 1.8 acres in size and completely fenced. The site was bound to Sorensen Avenue on the east, Liquid Air Corporation to the northwest, Plastall Metals Corporation to the north, and a Southern Pacific Railroad easement and Mckesson Chemical Company to the south.

The property was owned by Southern Pacific Transportation Company and was not developed until 1976.

The Angeles Chemical Company has operated as a chemical repackaging facility since 1976. A total of thirty-four (34) underground storage tanks (USTs) existed beneath the site. Two USTs, one gasoline and one diesel, and ten chemical USTs were excavated and removed under the oversight of the Santa Fe Springs Fire Department. Twelve (12) chemical USTs were decommissioned in place and slurry filled. The remaining ten (10) USTs are currently used as secondary containment for spill prevention. Chemicals which have been stored and used on site include, but are not limited to, acetone, methylene chloride, 1,1,1-trichloroethane (1,1,1-TCA), tetrachloroethene (PCE), methyl ethyl ketone (MEK), toluene, xylene, kerosene, diesel, and unleaded gasoline.

In January 1990, SCS conducted a site investigation. SCS advanced eight borings from 5' below grade (bg) to 50' bg. Soil samples collected and analyzed identified benzene, 1,1-Dichloroethane (1,1-DCA), 1,1-Dichloroethene (1,1-DCE), MEK, methyl isobutyl ketone (MIBK), toluene, 1,1,1-TCA, PCE, and xylenes at detectable concentrations.

In June 1990, SCS performed an additional site investigation at the site by advancing six additional borings advanced from 20.5' bg to 60' bg. A monitoring well (MW-1) was also installed. Soil sample analysis identified detectable concentrations of the above mentioned VOCs in addition to acetone and methylene chloride. Dissolved benzene, 1,1-DCA, 1,1-DCE, PCE, TCE, and trans-1,2-dichloroethene were detected in MW-1 above maximum contaminant levels.

Between 1993 and 1994, SCS performed further testing at the site. Soil samples were collected from nine borings. Five borings were converted to groundwater wells MW-2 through MW-6 (See Figure 2, SCS Well Location Map). The predominant compounds detected in soil were acetone, MEK, MIBK, PCE, toluene, 1,1,1-TCA, TCE, and xylenes. Groundwater sample collection and analysis identified the following using EPA method 624:

Component Analyzed	MW-1	MW-2	MW-3	MW-4	MW-6	MW-7
Benzene	194	<100	63	111	795	46
1,1-DCA	649	1,130	85	1,410	2,260	2,130
1,2-DCA	<100	<100	<50	<100	1,140	31
1,1-DCE	2,210	2,460	2,800	806	1,240	151
Ethylbenzene	333	1,720	115	1,180	1,910	45
Methylene Chloride	1,220	2,980	6,530	4,760	21,400	<50
PCE	662	2,150	5,370	3,320	2,130	134
Toluene	560	7,390	579	12,700	13,500	398
1,1,1-TCA	9,370	3,470	444	36,200	114,000	90
TCE	7,160	3,040	1,730	14,300	1,320	45
Xylenes	1,750	7,790	1,014	4,362	4,710	186
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L

In 1996, SCS performed separate soil vapor extraction pilot testing beneath the site at approximately 10' bg and 22' bg. Laboratory analysis identified maximum soil vapor gas concentrations as 1,1,1-TCA (30,300 ppmV) with detectable concentrations of 1,1-DCE, TCE, methylene chloride, toluene, PCE and xylenes. The maximum radius of influence from the various extraction units used were measured as 35 feet at 10' bg and 80 feet at 22' bg.

In November 1997, SCS performed a soil vapor survey at the site. Soil vapor samples were collected at twelve locations at 5' bg. In addition, soil vapor samples were collected at 15' bg in five of the twelve sampling points (See Figure 3 for SCS Soil Vapor Survey Points). The soil vapor survey identified maximum VOC contaminants near the railroad tracks on site, the location where a rail tanker reportedly had an accidental release.

In July 2000, BEII contracted BLC Surveying, Inc. to perform a site survey. Well locations were recorded using the California Plane coordinate systems. A copy of the survey is on file with the DTSC.

In September 2000, Blaine Tech Services, Inc. gauged the six on-site monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-6, and MW-7) under the supervision of BEII. Free product (FP) was identified in monitoring well MW-4 at 0.21-feet in thickness. Approximately 0.5 liters of FP were removed from the well and placed in a sealed 55-gallon drum.

BEII performed a soil vapor gas survey at the site from November 27 to December 1, 2000. A total of 36 soil vapor sample points, labeled SV1 through SV36, were selected by BEII and approved by the DTSC for analysis. Two discrete soil vapor samples were collected from each soil vapor sample point, one at 8' bg and one at 20' bg. SV1 was an exception since the

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first soil vapor sample was collected at 10' bg instead of 8' bg (See Figure 4, BEII Soil Vapor Sample Locations). Based on the soil vapor sample results, BEII identified relatively low level concentrations of VOCs in the silty clay soils at 8' bg. However, the concentrations of VOCs are significantly higher in the sandy soils at 20' bg. See Table 1 for soil vapor sample results.

On November 30, 2000, Blaine Tech Services, Inc. (Blaine) was contracted to perform groundwater sampling at the site. Groundwater monitoring wells MW-4 and MW-6 identified were not sampled due to insufficient water and presence of free product. These wells were installed to monitor a perched groundwater body to the north. Free product was identified in MW-1 during sample collection, upon completion of well purging. The potentiometric groundwater level was above the well screen. Groundwater purging lowered the potentiometric level below the screened interval, allowing free product to enter. Groundwater sample analysis identified thirteen constituents of concern (COCs) in the dissolved phase as VOCs only. See Table 2 for groundwater sample results. Laboratory analysis of metals and SVOCs identified concentrations below allowable levels for those constituents.

Currently, six of the remaining USTs are being excavated for closure under the supervision of the Santa Fe Springs fire Department. The remaining USTs will be slurry filled.

3.0) REGIONAL GEOLOGY/HYDROGEOLOGY

The site is located near the northern boundary of the Santa Fe Springs Plain within the Los Angeles Coastal Plain at an elevation of approximately 150 feet above mean sea level. Surficial sediments consist of fluvial deposits composed of inter-bedded gravel, sand, silt, and clay. Available data from California Water Resources Bulletin No. 104 (June 1961) indicate that the surficial sediments may be Holocene and/or part of the upper Pleistocene Lakewood Formation, which ranges from 40 to 50 feet thick beneath the site. The Lakewood Formation has lateral lithologic changes with discontinuous permeable zones that vary in particle size. Stratified deposits of sand, silty sand, silt, and fine gravel comprising the upper portion of the lower Pleistocene San Pedro Formation underlies the Lakewood Formation.

The site lies within the Central Basin Pressure area, a division of the Central Ground Water Basin, which extends over most of the Coastal Plain. The Gasper aquifer, a part of the basal coarse unit of Holocene deposits, is found within old channels of the San Gabriel and other rivers. The Gasper aquifer may be 40-feet in thickness, with its base at a depth of about 80 to 100-feet bg. The underlying Gage aquifer is found within the upper Pleistocene Lakewood Formation. The Hollydale aquifer is the uppermost regional aquifer in the San Pedro Formation. Bulletin 104 indicates that this aquifer averages approximately 30-feet in thickness in this area, with its top at a depth of about 70 feet bg. The major water producing aquifers in the region are the Lynwood aquifer located approximately 200-feet bg, the Silverado aquifer located at approximately 275-feet bg, and the Sunnyside aquifer located at approximately 600-feet bg.

4.0) SITE GEOLOGY/HYDROGEOLOGY

Two aquifers were identified by SCS during subsurface investigations performed at the site. A perched aquifer was encountered at approximately 23' bg and the Gaspur/Hollydale aquifer was encountered at 20' to 35' bg by SCS. The groundwater gradient flows to the southwest as identified by SCS. In September 2000, the groundwater was identified between 25.98' bg to 36.15' bg beneath the site.

SCS identified silty clays with some minor amounts of silt and sand in the shallow subsurface from surface grade to approximately 15' bg. Below the silty clay, poorly sorted coarse-grained sand and gravel from 15' bg to 26' bg. A less permeable silty clay layer was identified by SCS between 35' and 50' bg, which contains stringers of fine sand and silt that according to SCS is part of the Gaspur/Hollydale aquifer.

5.0) SCOPE OF WORK

BEII proposes that a soil vapor gas survey be performed at the southern end of the site to conceptualize the lateral extent of VOC soil vapors ~~in the~~ vadose zone between the McKesson and former Angeles Chemical Co. sites using ~~a mobile~~ laboratory to make real time field decisions. A previous soil gas survey performed in November 2000 has adequately defined soil gas vapors on the former Angeles Chemical site, therefore, the proposed soil gas survey will focus only on the southern property boundary which requires further delineation. The proposed work is submitted to the DTSC, the lead regulatory agency overseeing the site, for approval prior to commencement. Soil vapor gas will be collected at 5' bg, 10' bg and 20' bg, the same depths McKesson is collecting soil gas samples, using a direct push hydraulic rig supplied by HP Labs, an environmental licensed drill company (See Figure 5, BEII Proposed Soil Gas Survey Locations). The spacing between soil gas survey points along the southern boundary will be 50-feet on center, which is the minimum spacing used for the McKesson soil gas survey.

The probes will be inserted with a direct push rig provided by HP Labs standard operating procedure (SOP) (See Appendix A for HP Labs SOP). Soil vapors will be collected using the HP Labs SOP for soil gas sampling (See Appendix A for HP Labs SOP). Soil gas sample collection will be performed in accordance with LARWQCB guidelines (Appendix B for LARWQCB guidelines). Soil gas samples will be collected in glass tight syringes and analyzed on-site by HP Labs, a certified toxics analysis mobile laboratory for VOCs using EPA method 8260. A separate syringe will be used for each soil gas sample collected to avoid cross-contamination.

In addition, BEII proposes that a subsurface soil investigation be ~~performed~~ north of the site to ~~delineate the~~ lateral extent of VOCs identified by SCS ~~in~~ borings BH-15, BH-16, BH-17 and shallow soil samples RR-1 through RR-6. The proposed work is submitted to the DTSC, the lead regulatory agency overseeing the site, for approval prior to commencement. A direct push hydraulic rig supplied by HP Labs to advance up to 8 (eight) borings to 10' bg (See Figure 6, BEII Proposed Boring Locations). Soil samples will be collected at 5-foot intervals for VOC analysis using EPA method 8260.

Soil samples will be collected with a 2-foot split spoon sampler lined with four 1-inch by 24-inch acetate liners to provide continuous cores of the soil (See Appendix A for HP Labs SOP). The acetate will be screened in the field using an H-Nu DL 101 photoionization detector (PID) and geologically logged. At each collection depth, a section of the liner will be packaged with Teflon tape and capped for laboratory analysis. Each boring will be backfilled with bentonite chips. Soil samples will be logged on the chain-of-custody forms immediately following sampling of each boring to insure proper tracking through analysis in the laboratory. The above work will be performed under the direct supervision of a California Registered Civil Engineer.

5.1) Analytical Methods and Quality Assurance

A California Department of Health Services certified mobile laboratory (HP Labs) will conduct the chemical analysis of site samples. The mobile laboratory will maintain strict conformance to EPA standard methodologies, quality assurance/quality control (QA/QC) protocols and standard laboratory practices supporting EPA procedures (See Appendix A for HP Labs QA/QC procedures).

5.2) Schedule

It is anticipated that the proposed work will commence simultaneously with the proposed work at the McKesson facility, following acceptance of the work plan by the DTSC. Upon completion of work, a report of summarizing the work, evaluating the quality of the analytical data, interpretation of the data and recommendations for additional work, if needed, to resolve any data gaps will be submitted to the DTSC for review within forty-five days. The report will be signed by a California Registered Civil Engineer that has overseen site activities.

6.0) FIELD DOCUMENTATION AND CHAIN-OF-CUSTODY

The following sections describe the recording system for documenting all site field activities and the sample Chain-of-Custody Program.

6.1) Field Log Book

An accurate chronological recording of all field activities is vital to the documentation of any environmental investigation. To accomplish this, bound and numbered field logbooks will be maintained by the field team to provide a daily record of significant events, observations, and deviations from the work plan and measurements collected during the field activities. The records will contain sufficient information so that the work activities can be reconstructed without relying on the collector's memory. All entries will be signed, dated and made with waterproof ink. Corrections to the logbook will be made by drawing one line through the error, initialing and dating. The logbook will always be stored in a secure location.

6.1.1) Chain-of-Custody Record and Request for Analysis Report

Chain-of-Custody records establish the documentation necessary to trace sample possession from the time of collection to analysis. A serialized Chain-of-Custody and Request for Analysis Report will be completed and will accompany each batch of samples. The record will contain the following information.

* Project name and number;
* Request for Analysis control number (for cross reference);
* Names of sampling team members;
* Laboratory destination;
* Carrier/waybill number;
* Sample number;
* Sample location and description;
* Date and time collected;
* Sample type;
* Container type;
* Special instructions;
* Possible sample hazards;
* Signatures of persons involved in the chain-of-possession.

When sample custody is transferred to another individual, the samples must be relinquished by the present custodian and received by the new custodian. This will be recorded at the bottom of the Chain-of-Custody Record and Request for Analysis Report where the persons involved will sign, date and note the time of transfer. During field operations, each project geologist will act as the custodian for the samples he or she collects. Samples will not be left unattended unless placed, along with the Chain-of-Custody Record, in a secure container.

The Chain-of-Custody Record and Request for Analysis Report is a multi-part form that allows the record to be kept in duplicate. One copy will accompany the sample shipment to the laboratory and one copy will be kept with the field logbook. All documents that accompany shipments will be enclosed in zip-lock bag and taped to the inside top cover of the shipping container.

Chain-of-Custody and Request for Analysis Reports provide official communication to the laboratory by listing the particular analysis required for each sample. This also furnishes further evidence that the Chain-of-Custody is complete. The form will contain the following information:

* Cross-reference to the Chain-of-Custody Record;
* Project name and number;
* Sample number;
* Sample volume;
* Preservative as required;
* Requested testing program;
* Required turnaround time;
* Possible hazard identification;
* Sample disposal requirements;

The form will be signed and dated by the receiving laboratory sample management custodian.

6.1.2) Sample Identification

Sample labels prevent the misidentification of samples. Following sample collection, labels will be affixed to each sample container. Labels will record the following type of information.

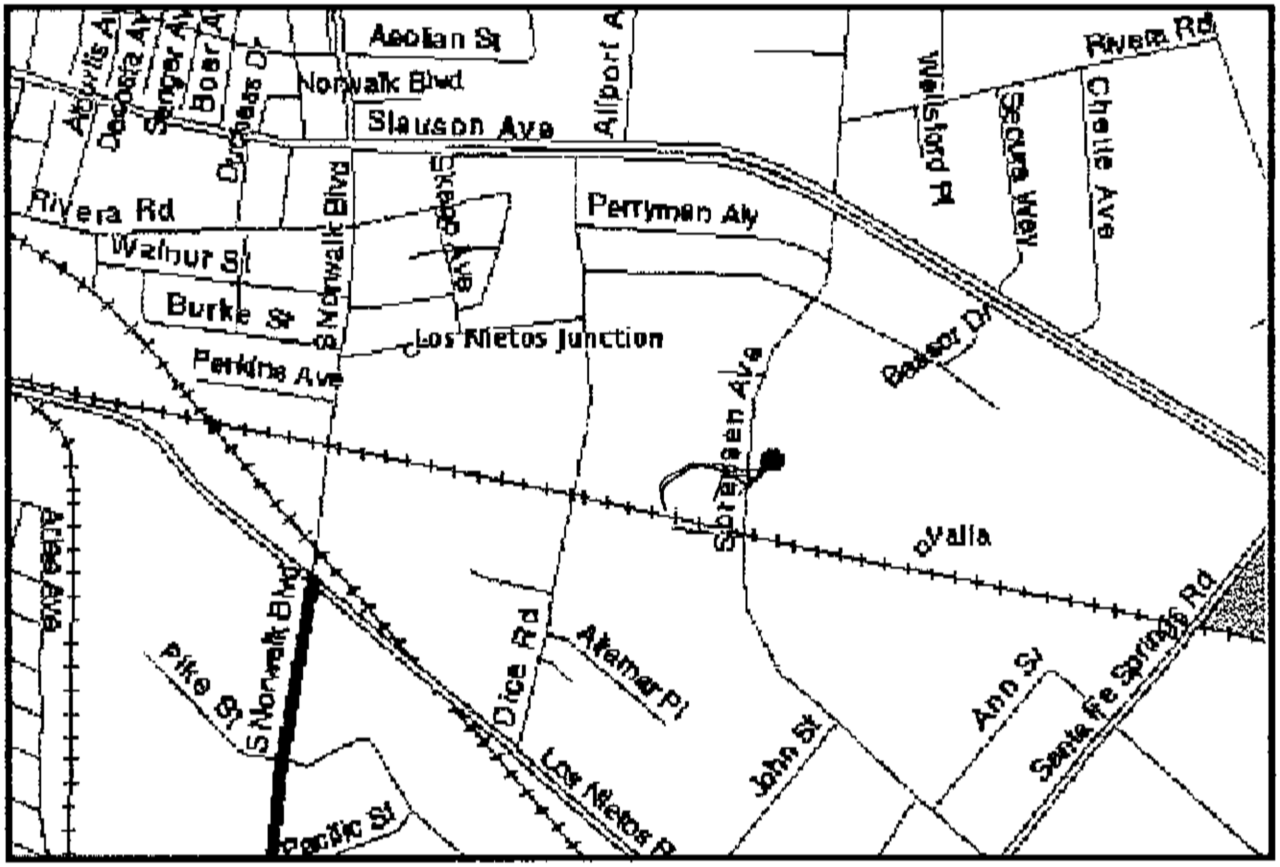
* Project name and number;
* Sample identification number;
* Name and sample collector;
* Date and time of collection;
* Analytical parameters;
* Known hazards;
* Pertinent comments;

Labels will be sufficiently durable to remain legible even when wet.

7.0) HEALTH AND SAFETY PLAN

The purpose of the project Health and Safety Plan (HASP) is to provide guidelines and procedures to ensure the health and physical safety of people working at the former Angeles Chemical Company facility. The goal of the HASP is to provide precautionary and responsive measures for the protection of on-site personnel, the general public and the environmental. A HASP is included as Appendix C.

FIGURES



Blakely Environmental Investigations, Inc. P.O. Box 339 Wrightwood, CA 92397	**Site Location** **Former Angeles Chemical Comany** **8915 Sorensen Avenue** **Santa Fe Springs, CA**	**Figure 1**

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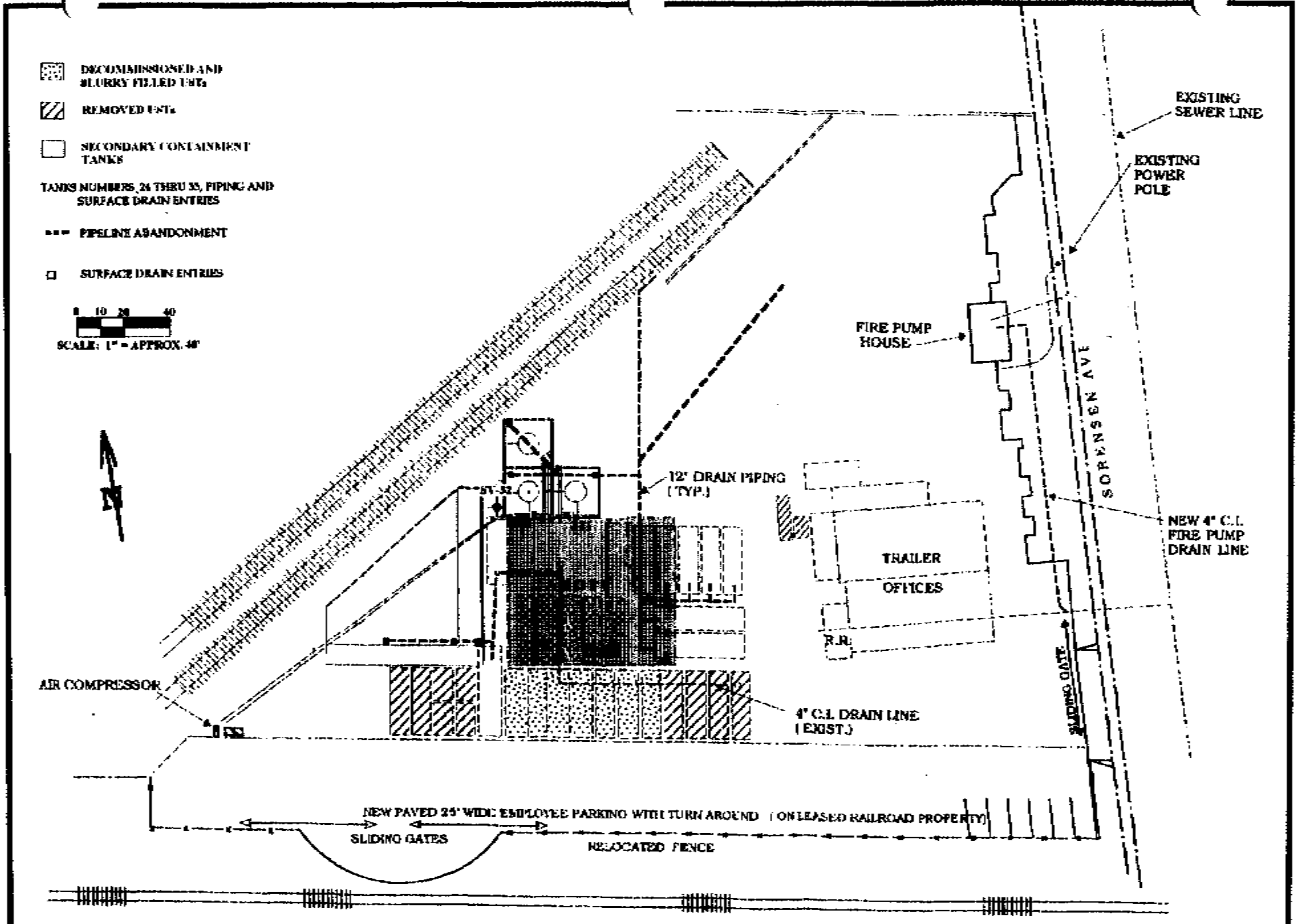

Blakely Environmental Investigations, Inc. P.O. Box 339 Wrightwood, CA	**Site Layout** Angeles Chemical Company 8915 Sorensen Avenue Santa Fe Springs, CA	**Figure 2**

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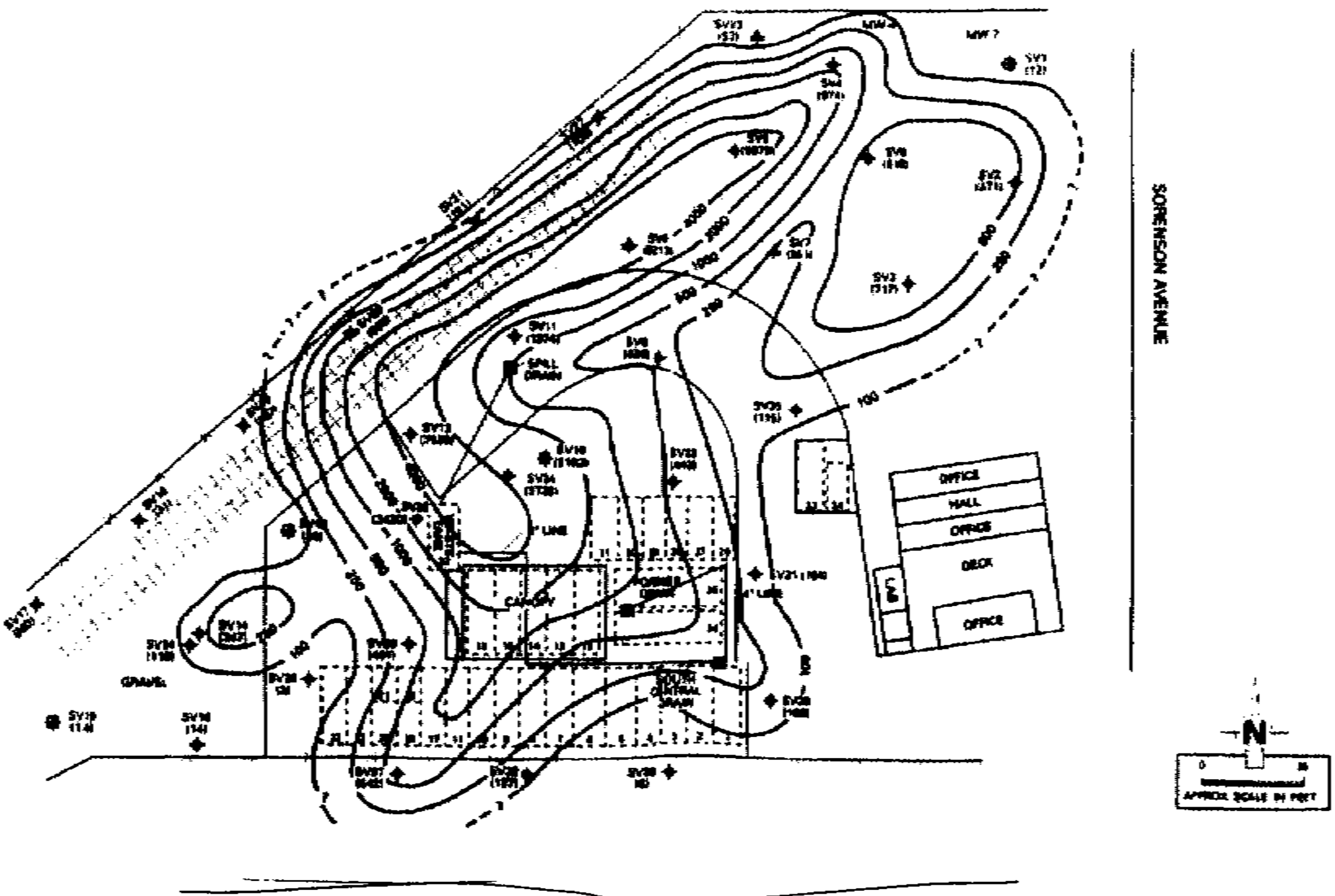

Taken from SCS Report

Blakely Environmental Investigations, Inc. P.O. Box 339 Wrightwood, CA	**SCS Soil Vapor Survey Points** Angeles Chemical Company 8915 Sorensen Avenue Santa Fe Springs, CA	**FIGURE 3**

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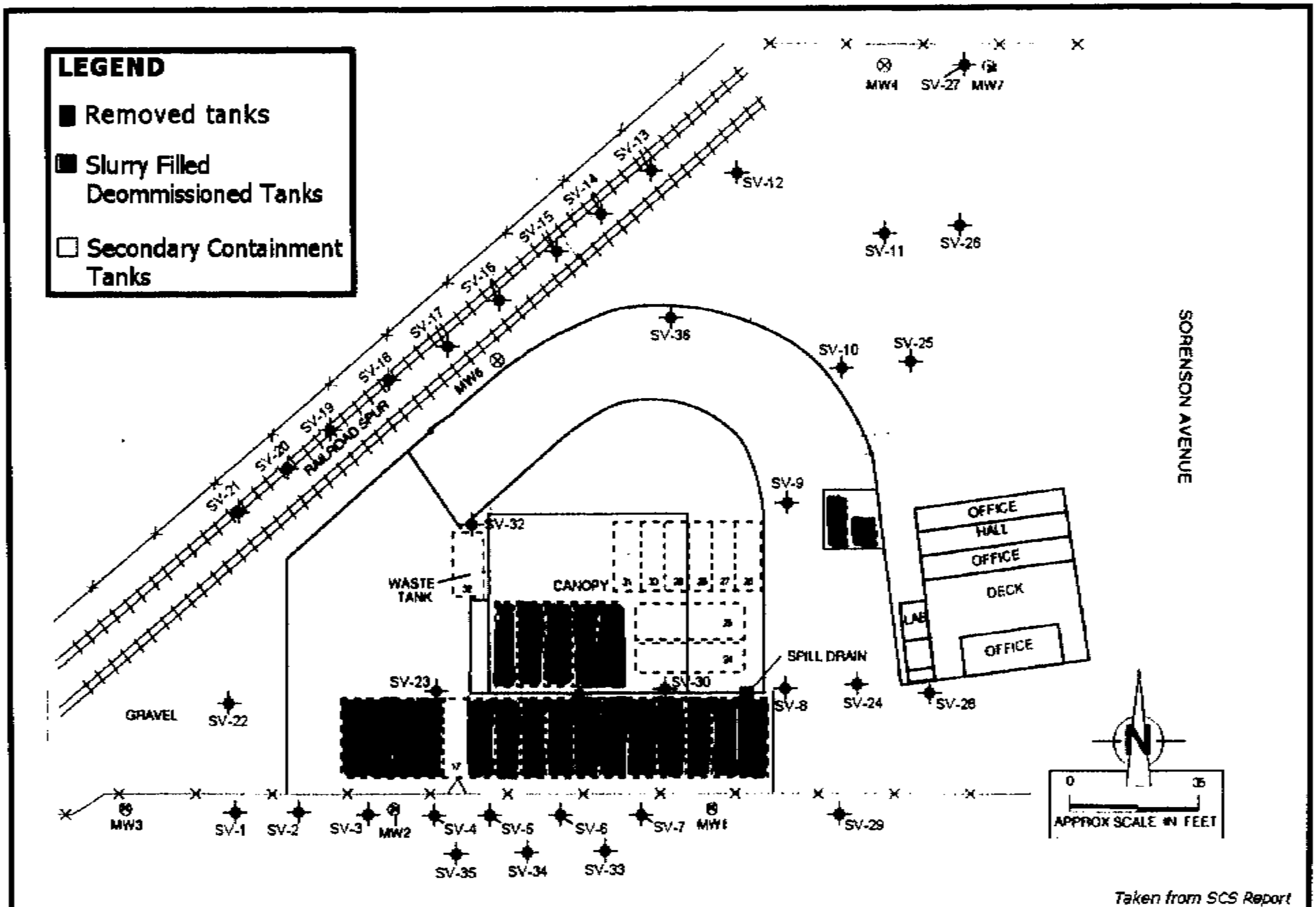
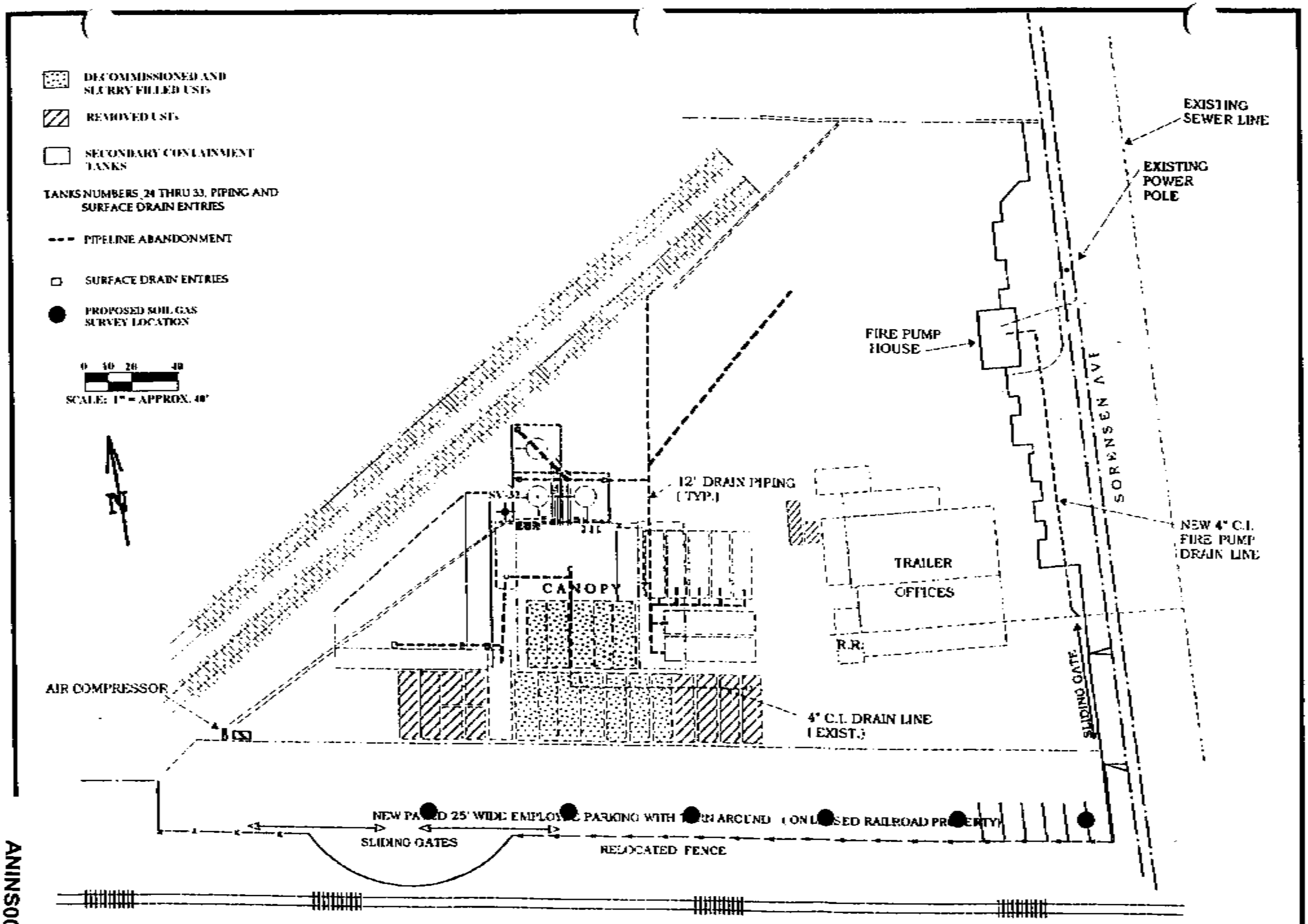


Blakely Environmental Investigations, Inc. P.O. Box 339 Wrightwood, CA	**BEII Soil Vapor Sample Locations** Angeles Chemical Company 8915 Sorensen Avenue Santa Fe Springs, CA	**Figure 4**

ANINS000416



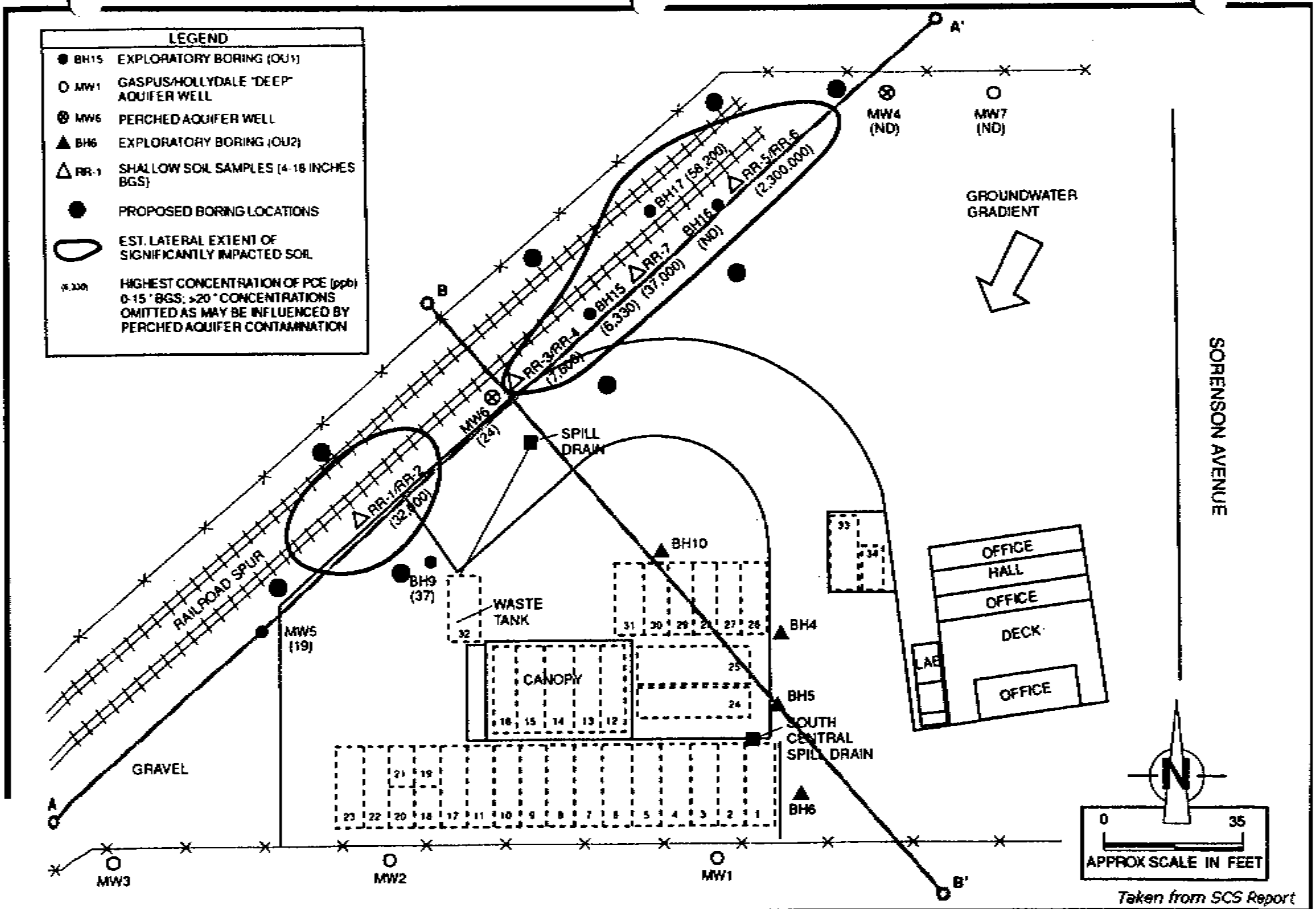
Blakely Environmental Investigations, Inc.
P.O. Box 339
Wrightwood, CA

Proposed Soil Gas Survey Locations

Angeles Chemical Company
8915 Sorensen Avenue
Santa Fe Springs, CA

Figure 5

ANINS000417



Taken from SCS Report

Blakely Environmental Investigations, Inc. P.O. Box 339 Wrightwood, CA	**BEII Proposed Boring Locations** Angeles Chemical Company 8915 Sorensen Avenue Santa Fe Springs, CA	**Figure 6**

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TABLES

Table 1: Soil Vapor COC Results (ug/L)

COCs	Depth	SV1	SV2	SV3	SV4	SV5	SV6	SV7	SV8	SV9	SV10
Benzene	8' bg	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10
	20' bg	<20	<1	<20	13	<50	<100	<500	<500	<500	<500
1,1-DCA	8' bg	2.8	3.3	<1	3.2	6.2	15	<10	34	13	16
	20' bg	120	4.7	270	1,700	2,000	6,600	8,700	9,200	5,200	1,000
1,1-DCE	8' bg	<1	<1	<1	<1	<1	5.1	<10	20	<10	19
	20' bg	35	1.3	75	190	220	830	1,300	2,100	4,800	3,900
cis 1,2-DCE	8' bg	2.9	3.2	3	7	5.5	27	13	25	31	87
	20' bg	370	14	520	2,200	2,300	7,400	5,400	3,700	4,600	2,200
Ethylbenzene	8' bg	<1	<1	<1	<1	<1	8.4	<10	10	13	<10
	20' bg	<20	<1	<20	90	110	600	960	590	610	<500
PCE	8' bg	<1	1.2	2.4	<1	<1	6.9	<10	42	12	54
	20' bg	70	<1	<20	<10	<50	<100	<500	<500	<500	<500
1,1,1-TCA	8' bg	<1	<1	<20	3.1	<1	14	25	140	32	160
	20' bg	<20	<1	3.1	65	230	2,200	790	2,900	18,000	12,000
TCE	8' bg	<1	<1	<1	1.8	<1	1.3	<10	36	<10	<10
	20' bg	32	1.1	<20	15	<50	<100	<500	<500	<500	<500
Toluene	8' bg	<1	<1	<1	<1	<1	32	27	240	120	30
	20' bg	<20	<1	<20	400	1,000	5,300	2,600	12,000	2,800	<500
Xylenes	8' bg	<1	<1	<1	2.1	<1	27.8	24	30	60	11
	20' bg	<20	2.2	<20	273	380	1,730	2,740	1,400	1,700	<500

Blue= Chemicals stored on-site.
Red= Transformation compounds from chemicals stored on-site.

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Table 1 (cont.): Soil Vapor COC Results (ug/L)

COCs	Depth	SV11	SV12	SV13	SV14	SV15	SV16	SV17	SV18	SV19	SV20
Benzene	8' bg	<1	<1	<10	<1	<1	<10	<20	<100	<10	<10
	20' bg	<100	<100	<500	<500	<1,000	<1,000	<2,000	<200	<200	<200
1,1-DCA	8' bg	52	4.2	<10	2	9.9	<10	66	<100	<10	<10
	20' bg	520	780	<500	790	<1,000	<1,000	<2,000	520	1,500	1,100
1,1-DCE	8' bg	13	4.5	<10	3.2	27	45	150	<100	12	<10
	20' bg	3,700	3,800	1,600	4,800	6,000	7,200	4,500	1,100	1,500	1,100
cis 1,2-DCE	8' bg	70	20	11	4.9	16	<10	<20	<100	17	22
	20' bg	3,700	15,000	3,600	3,100	<1,000	<1,000	<2,000	1,000	3,200	4,500
Ethylbenzene	8' bg	6.6	<1	<10	3.8	8.1	41	46	<100	29	18
	20' bg	<100	140	<500	900	<1,000	<1,000	<2,000	330	390	1,600
PCE	8' bg	36	1.3	<10	1.9	8.1	54	43	<100	13	13
	20' bg	<100	1,800	<500	2,000	<1,000	<1,000	<2,000	<200	200	3,100
1,1,1-TCA	8' bg	<1	6.6	<10	14	130	570	3,500	720	160	76
	20' bg	6,900	23,000	6,800	28,000	39,000	70,000	43,000	5,300	5,600	4,900
TCE	8' bg	5.2	4.4	<10	7.2	32	31	79	<100	<10	13
	20' bg	<100	630	1,300	2,600	1,200	2,700	<2,000	240	390	2,200
Toluene	8' bg	46	2.6	11	13	35	75	240	170	29	18
	20' bg	150	1,800	2,500	5,100	1,900	2,600	2,800	4,000	390	1,600
Xylenes	8' bg	24.9	1.8	12	13.7	31.6	164	191	<100	99	68
	20' bg	170	340	1,000	3,490	1,100	1,900	<2,000	250	1,340	5,800

Blue= Chemicals stored on-site.
Red= Transformation compounds from chemicals stored on-site.

Table 1 (cont.): Soil Vapor COC Results (ug/L)

COCs	Depth	SV21	SV22	SV23	SV24	SV25	SV26	SV27	SV28	SV29	SV30
Benzene	8' bg	<10	<10	<10	<10	<10	<10	<1	<1	<1	<10
	20' bg	<1,000	<200	<200	<200	<250	<500	<500	<100	<100	<200
1,1-DCA	8' bg	<10	<10	63	<10	11	<10	2.2	2.5	4.7	110
	20' bg	<1,000	230	1,800	10,000	860	<500	<500	5,400	5,800	1,600
1,1-DCE	8' bg	<10	<10	10	<10	25	11	4.9	8.5	3.9	17
	20' bg	<1,000	<200	240	2,900	5,000	4,100	2,400	2,200	1,700	200
cis 1,2-DCE	8' bg	12	19	210	17	15	11	10	24	8.4	410
	20' bg	4,300	1,400	2,100	4,000	2,700	2,900	3,400	2,000	2,300	830
Ethylbenzene	8' bg	23	<10	14	<10	<10	<10	1.3	1.1	3.8	76
	20' bg	<1,000	370	320	1,700	<250	<500	<500	300	630	520
PCE	8' bg	30	13	<10	<10	<10	<10	1	1.7	<1	<10
	20' bg	<1,000	<200	<200	<200	<250	<500	<500	<100	<100	<200
1,1,1-TCA	8' bg	27	<10	48	<10	<10	18	11	19	5.3	50
	20' bg	<1,000	<200	360	280	12,000	6,700	4,200	650	<100	240
TCE	8' bg	11	<10	<10	<10	<10	<10	<1	<1	<1	<10
	20' bg	<1,000	<200	<200	<200	<250	<500	<500	<100	<100	<200
Toluene	8' bg	200	75	38	24	50	20	8	6.8	7.9	690
	20' bg	8,800	400	3,500	12,000	<250	<500	<500	300	1,500	2,900
Xylenes	8' bg	83	33	122	12	29	12	5.3	4.6	13.1	308
	20' bg	2,500	440	1,350	5,700	<250	<500	<500	740	2,100	1,990

Blue= Chemicals stored on-site.
Red= Transformation compounds from chemicals stored on-site.

ANINS000421

Table 1 (cont.): Soil Vapor COC Results (ug/L)

COCs	Depth	SV31	SV32	SV33	SV34	SV35	SV36
Benzene	8' bg	<20	<1	<1	<2	<1	<10
	20' bg	<200	300	<100	<200	<200	<500
1,1-DCA	8' bg	<20	10	7.9	20	26	27
	20' bg	<200	7,700	8,100	4,700	2,900	1,300
1,1-DCE	8' bg	<20	4.9	2.9	<2	2.9	13
	20' bg	<200	3,200	1,200	580	380	9,400
cis 1,2-DCE	8' bg	120	16	10	19	46	71
	20' bg	450	5,400	5,700	5,300	3,300	1,900
Ethylbenzene	8' bg	<20	8.8	13	4.8	15	18
	20' bg	<200	2,100	580	410	230	<500
PCE	8' bg	<20	2.2	9	<2	1.7	<10
	20' bg	<200	1,600	<100	<200	<200	850
1,1,1-TCA	8' bg	120	6.2	12	4.6	7	22
	20' bg	710	10,000	720	920	<200	90,000
TCE	8' bg	130	5.5	4.6	<2	1	<10
	20' bg	550	2,000	<100	<200	<200	2,700
Toluene	8' bg	260	45	73	13	55	72
	20' bg	950	33,000	1,600	2,700	280	1,300
Xylenes	8' bg	44	37.4	65	13.2	49	58
	20' bg	250	9,200	1,270	1,150	480	980

Blue= Chemicals stored on-site.
Red= Transformation compounds from chemicals stored on-site.

Table 2: Groundwater COC Sample Results (ug/L)

COCs	Date	MW-1	MW-2	MW-3	MW-4	MW-6	MW-7
Benzene	Feb-94	194	<100	63	111	795	46
	Nov-00	<2,500	61	73	NS-FP	NS-FP	65
1,1-DCA	Feb-94	649	1,130	85	1410	2,260	2,130
	Nov-00	17,000	1,800	800	NS-FP	NS-FP	2,800
1,2-DCA	Feb-94	<100	<100	<50	<100	1140	31
	Nov-00	<2,500	<500	<500	NS-FP	NS-FP	<500
1,1-DCE	Feb-94	2,210	2,460	2,800	806	1,240	151
	Nov-00	3,000	<500	2,900	NS-FP	NS-FP	350
cis 1,2-DCE	Feb-94	NA	NA	NA	NA	NA	NA
	Nov-00	20,000	9,500	5,700	NS-FP	NS-FP	210
trans 1,2-DCE	Feb-94	NA	NA	NA	NA	NA	NA
	Nov-00	<2,500	<500	<500	NS-FP	NS-FP	<500
Ethylbenzene	Feb-94	333	1,720	115	1,180	1,910	45
	Nov-00	960	120	1,000	NS-FP	NS-FP	82
MEK	Feb-94	NA	NA	NA	NA	NA	NA
	Nov-00	3,100	<10,000	<10,000	NS-FP	NS-FP	1,400
Methylene Chloride	Feb-94	1,220	2,980	6,530	4,760	21,400	<50
	Nov-00	1,100	180	5,600	NS-FP	NS-FP	180
PCE	Feb-94	662	2,150	5,370	3,320	2,130	134
	Nov-00	<2,500	<500	130	NS-FP	NS-FP	<500
1,1,1-TCA	Feb-94	9,370	3,470	444	36,200	114,000	90
	Nov-00	<2,500	<500	70	NS-FP	NS-FP	<500
TCE	Feb-94	7,160	3,040	1,730	14,300	1,320	45
	Nov-00	<2,500	<500	1,500	NS-FP	NS-FP	<500
Toluene	Feb-94	560	7,390	579	12,700	15,300	398
	Nov-00	4,000	57	3,700	NS-FP	NS-FP	800
Xylenes	Feb-94	2,192	7,790	1,014	4,362	4,710	186
	Nov-00	3,400	<500	2,500	NS-FP	NS-FP	247
DTW	Feb-94	30.05'	28.80'	29.70'	23.35'	24.85'	24.53'
	Nov-00	35.62'	35.28'	36.42'	26.20'	28.52'	28.19'

DTW= Depth to Water.
NA= Not Analyzed.
NS-FP= Not Sampled Free Product present.
Blue= Chemicals stored on-site.
Red= Transformation compounds from chemicals stored on-site.

APPENDICES

THE *STRATAPROBE*™ SYSTEM

DIRECT PUSH TECHNOLOGY
FOR SOIL, WATER AND SOIL VAPOR SAMPLING
C-57 License #769131

STANDARD OPERATING PROCEDURES
2000

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1.0 Vehicle

1.1 Discussion

The *STRATAPROBE™* is a rugged, lightweight hydraulic drive point system designed to perform sampling and monitoring services specific to the environmental industry. The carrier vehicle is a four wheel drive, one ton pickup truck with a reliable power take-off hydraulic system. One of the most versatile systems of its kind the *STRATAPROBE* can drive an assortment of sampling devices fifty to sixty feet in many soil formations.

The direct push hydraulic unit consists of a rear-mounted, dual ram configuration mounted in conjunction with a vibrating component that is capable of producing high-frequency impact energy. A 5,000 pound static reaction weight and 15,000 pound pullback capacity provide ample force to overcome most common geologic conditions. The low profile mast is twelve feet high when fully extended and the framework of the machine is boom articulated to allow for a full range of positioning, including up to a 20 degree angle for boring underneath structures.

The *STRATAPROBE*'s low profile and articulated boom provide for easy access when sampling under canopies, adjacent to structures and inside buildings. Hand held portable equipment is also available where truck access is not possible.

1.2 Operation

The STRATAPROBE is operated from a station at the rear of a 1-ton pickup truck. The probing unit is hydraulically powered via a power takeoff pump mounted directly to the truck's transmission. Positioning, pushing, and retracting of the probe and hammer is controlled by two separate hydraulic control manifolds located at the operating station. Each manifold consists of four to six spring-return to neutral control valves. The spring return feature provides a safety function, which stops all probing and positioning action if the operator releases the valve.

1.3 Emergency Operation

In the event of any emergency such as fire or hydraulic system failure all power to the probing unit and vehicle can be secured by turning off the vehicle ignition key. A fire extinguisher is carried in the truck cab for emergency use. Under no circumstances should the truck or probe be operated in other than its normal configuration.

2.0 Soil Sampling Procedures

2.1 Discussion

Soil samples may be obtained by using either of two primary methods, a 2.0-inch O.D. (outside diameter) x 36-inch overall length coring tube or 2.0-inch O.D. x 24-inch (nominal) overall length discrete piston sampler.

The samplers are threaded onto the leading edge of *STRATAPROBE* 1.5-inch O.D. probe rod and advanced to depth using the *STRATAPROBE* direct push system. The probe rods are nominally 4-feet in length and additional rods are connected to reach the desired depth. Soil samples are retrieved by retracting the probe rod and sampler to the surface and disassembling the sampler.

Samples are obtained in industry standard 1-inch to 1.25-inch sleeves made of brass, stainless steel, or acetate. The sleeves are removed from the sampler, teflon squares are placed over each end and capped for transport to a laboratory for analysis.

HP's continuous coring system drives a 2" O.D. casing and a 24" split barrel sampler. The casing remains in place while the sampler is withdrawn preventing any sloughing or cross contamination. The 24" split barrel is then lowered into the casing and the system is advanced another 2', repeating the process until the desired depth is reached. Samples are withdrawn from the split barrel in 1" x 24" acetate liner, or stainless steel and brass liners may be used.

Sampling rates vary from 100' to 200' per day depending on soil conditions. Use of the coring tube provides for observation of subsurface conditions. The coring tube can also be used to create an open bore hole for inserting water or vapor monitoring well points.

3.0 GROUNDWATER SAMPLING PROCEDURES

STRATAPROBE provides high quality groundwater sampling using one of the following techniques:

3.1 HYDROPUNCH II™ - TYPE GROUNDWATER SAMPLING

Groundwater samples are obtained using a Hydropunch II™ - type of sampler. The sampler is a 36" x 2.0" diameter split barrel tube containing a retracted and shielded stainless steel well screen with a drop-off expendable point. The sampler is threaded onto a 1.5" O.D. heavy duty probe rod and advanced directly into the aquifer in the shielded position with the STRATAPROBE direct push system.

When the desired depth is reached, the probe rod is retracted approximately 24". The expendable point drops off and the stainless steel sample screen is exposed. Groundwater flows past the screen and into the void space of the sampler. Samples are then obtained using either a 1/2" O.D. (minimum) bailer or using a peristaltic pump and inert tubing.

3.2 SAMPLING POINT GROUNDWATER SAMPLING

Groundwater samples are obtained using a sample point consisting of a 36" x 1/2" diameter slotted teflon well screen connected to the surface via 3/8" diameter inert nylaflow tubing. The sampler is inserted by first driving a 1.5" O.D. heavy duty probe rod, point holder and expendable point with an o-ring seal directly into the aquifer. When the desired depth is reached, a short section of the slotted well screen attached to an inert nylaflow or clear plastic tubing is lowered to the bottom of the drive rod. The drive rod and point holder are then withdrawn, the expendable point drops off and the well screen is exposed to the aquifer.

Groundwater flows past the screen and into the void space of the sampler. Groundwater samples are then obtained using either a bailer or peristaltic pump connected to nylaflow tubing.

3.3 MINI-WELL GROUNDWATER SAMPLING

A temporary mini-well can be installed by driving the *STRATAPROBE* 2.0" O.D. x 1.5" I.D. continuous coring system. An expendable shoe is placed on the bottom of the casing so that a 1" I.D. mini-well can be installed in the cased hole. A sand filter pack is placed from the bottom of the well screen to approximately 2' above the screened interval as the casing is removed. The hole is completed with a bentonite seal, concrete plug and traffic box as required.

Groundwater flows past the screen and into the void space of the sampler. Samples are then obtained using either a 1/2" O.D. (minimum) bailer or using a peristaltic pump and inert tubing.

4.0 Soil Vapor Sampling Procedures

4.1 Discussion

Soil vapor samples are obtained by using a 1.5-inch O.D. (outside diameter) drive point holder and a hardened drop-off steel point. The sampler is threaded onto the leading edge of 1.5-inch O.D. probe rod and advanced to depth using the *STRATAPROBE* direct push system. The probe rods are nominally 4-feet in length and additional rods are connected to reach the desired depth.

Once inserted to the desired depth, the probe rod is retracted slightly to expose the vapor sampling port. A small diameter inert tubing is inserted through the center of the rod and threaded into a gas tight fitting just above the tip.

Soil vapor is withdrawn from the inert nylaflow tubing using a 20 cubic centimeter (cc) syringe connected via an on-off valve. The first 5 dead volumes of gas are drawn and discarded to flush the probe and fill it with in-situ soil vapor. The next 20 cc of gas are withdrawn in the syringe, plugged, and immediately transferred to a mobile lab for analysis within minutes of collection. The use of small calibrated syringes allows for careful monitoring of purge and sample volumes. This procedure ensures adequate sample flow is obtained without excessive pumping of air or introduction of surface air into the sample.

After a sample is obtained, the sample tubing is removed from the probe and either replaced are flushed with clean air depending on the contamination level detected. This design prevents clogging of the sampling port and cross-contamination from soils during insertion.

4.2 Quality Control

Prior to sampling each day, all components of the sampling system are checked for contamination by drawing ambient air from above ground through the sampling equipment, and injecting a sample into a gas chromatograph. The analysis results are compared to that of the ambient air and recorded in the analytical data tables as blanks. Additional method blanks are run throughout the day depending on the level of contamination encountered.

4.3 Soil Vapor Implants / Monitoring Mini-Wells

Each vapor monitoring well consists of a perforated tip and 1/8" nylaflow tubing that runs to the surface. The top of the line may be terminated by various methods. Generally, the top is terminated and plugged using 1/8" swagelok ends. This allows a variety of devised to be connected later if needed. Pressure valves are also available with fittings for connection to pressure monitoring equipment.

At each vapor monitoring probe location, HP Lab's truck-mounted hydraulic probe may be used to advance interconnected 3 ft lengths of steel pipe to the required depth. The pipe will be removed and the perforated tube inserted and developed with a filter pack and bentonite seal to the surface. Refer to Exhibit A for diagram.

5.0 Decontamination Procedures

5.1 Discussion

Decontamination procedures are selected based on soil conditions, type and degree of contamination, and type of sampler used. In all cases, drive rods and samplers are wiped free of loose dirt and foreign material.

Soil and groundwater samplers, and rods if necessary, are disassembled and put through a three step wash and rinse cycle which includes:

- phosphate-free detergent, brush and de ionized water to remove soil and debris
- rinse with tap water
- rinse with deionized water

Soil vapor sampling rods and external are cleaned of excess dirt and moisture between each location. The probe's internal nylaflow tubing is also flushed with hundreds of cubic centimeters of air between sampling locations. If contamination levels in excess of 100 ug/L-vapor are detected the sample tubing is replaced. Sampling syringes are flushed with clean air after each use.

Additional decontamination procedures including a high temperature, high pressure wash system or the use of specific cleaning compounds may be incorporated at the client's request.

6.0 Miscellaneous

6.1 Field Collection Log

The field technician maintains a log sheet summarizing depth of penetration, refusal, which probe was used on each sampling location, when tubing was replaced, any visual contamination on the probe, and any other unusual occurrences which occurred at a particular sampling location.

6.2 Hole Abandonment

Hole abandonment procedures are based on the geology encountered, the depth of the hole and workplan requirements. Granulated bentonite is normally used to completely fill the probe hole. The bentonite can be hydrated or mixed with cement as a grout if requested. Additionally, hole closure can be from top-to-bottom or bottom up via the tremie method, depending on workplan requirements.

7.0 Health and Safety Practices

7.1 Equipment inspection procedures

Prior to the commencement of work, the following components of the Strataprobe platform should be inspected:

- ◊ Controls - all controls should be clear of obstruction, should be accessible from level ground, and should be free of dirt, water, or any other substance that may inhibit proper use.
- ◊ Hoses and hydraulics - all hoses and hydraulic components should be configured to move freely. All hose "pinch points" should be eliminated. The hydraulic fluid reservoir should be inspected for dirt, water, and the proper fluid level.
- ◊ Derrick / mast - the derrick / mast assembly should be inspected for signs of cracks or stress. It is recommended that the vehicle be grounded via a minimum four foot copper rod in the event of inclement weather.

In addition, the following tools should be inspected:

- ◊ Concrete and asphalt coring equipment / power tools - power cords should be free from cracks and weathering, bits and cutting edges should be sharp and clean.
- ◊ Sample collection equipment - drive pipe should be straight and free of burrs. All samplers should be clean, free of signs of stress, and work freely.
- ◊ Generator - should be properly ventilated, fueled, and have the proper noise abatement equipment installed.

7.2 Personal Protection Equipment (PPE)

The nature of Strataprobe work normally requires the use of varying levels of PPE, which includes but is not limited to:

- ◊ Head protection - hard hat
- ◊ Ear protection - ear muffs or ear plugs
- ◊ Eye protection - safety glasses
- ◊ Hand protection - chemical resistant gloves
- ◊ Foot protection - ANSI approved safety footwear
- ◊ Body protection - TYVEK suits, splash aprons, etc.
- ◊ Respiratory protection - full face air-purifying respirators.

7.3 Emergency Response

The nature of the Strataprobe sampling platform presents various operating hazards. It is primarily a hydraulically operated system. The possibility of leaks, over heating, fire, and personal injury do exist.

In the event of a hydraulic leak:

◊ Disengage the PTO (Power Take Off). Turn off the vehicle engine.
◊ Contain any spill or contamination of hydraulic fluid.
◊ Determine the source of the leak. If it is at a fitting, attempt to stop the leak by tightening or re-seating the fitting. Teflon tape may be employed to create a better seal.
◊ If the leak is in a hose itself or some other inaccessible area, the vehicle may need to be serviced by a professional.
◊ Assuming the repair is successful, start the vehicle engine, engage the PTO, and test the system. If a leak persists, shut down the operation and call for service.

In the event of overheating:

◊ Disengage the PTO. Turn off the vehicle engine.
◊ If the overheating is in the hydraulic system itself, check the reservoir fluid level. A lack of fluid may cause the system to overheat.
◊ If the overheating is in the hammer, allow the hammer to cool. Excessive use can create extreme heat.
◊ If the overheating is in the vehicle engine, allow the engine to cool. Check the cooling system for proper coolant level. Add coolant if necessary. Check the radiator / fan assembly for obstruction. Air must flow freely across the radiator, and the fan must turn freely.

In the event of fire:

◊ Access the situation. Is the fire too big or involved to safely extinguish? If the fire is small and localized, use the extinguisher if it is safe to do so. **REMEMBER: most fire extinguishers only work for 5 to 10 seconds**. Will that be enough time to put the fire out?
◊ If the fire is not put out or is too involved, call 911.
◊ Don't be a hero. Property can be replaced, but lives cannot.

In the event of personal injury:

◊ Treat the victim as necessary. Stabilize the individual and seek professional medical assistance. If someone else is available, stay with the individual and send them for help. If it is obvious that the injury is critical and a telephone is available, treat the injury as best as possible and call 911 immediately.

STATE OF CALIFORNIA
California Regional Water Quality Control Board
Los Angeles Region

INTERIM GUIDANCE FOR ACTIVE SOIL GAS INVESTIGATION
(February 25, 1997)

Introduction

Volatile organic compounds (VOCs) within the unsaturated zone partition into the adsorbed, dissolved, free liquid, and vapor phases. Measurement of VOCs through an active soil gas investigation allows: 1) evaluation of whether waste discharges of VOCs have occurred which may impact groundwater, 2) determination of spatial pattern and extent of vapor phase soil contamination, 3) establishment of vapor distribution for the design of soil vapor extraction (SVE) system, and 4) determination of the efficiency of reduction in threat to groundwater from any cleanup action, including SVE. The work plan should include, but not be limited to, the following:

1.0 Survey Design

1.1
Provide a scaled facility map depicting potential sources and proposed sampling points. Include locations and coordinates of identifiable geographic landmarks (e.g., street center-line, benchmark, street intersection, wells, north arrow, property line).

1.2
Locate initial sampling points in potential source areas and areas with known soil contamination using an adjustable 10 to 20 foot grid pattern. Provide rationale for the number, location and depth of sampling points. Screen the remainder of the site with a 100-foot or less grid pattern.

1.3
Conduct a close interval (10 to 20 foot grid pattern) and multi-level sampling (5 to 10 feet vertical distance between points) in areas with known or relatively high VOC concentrations.

1.4
Use an on-site mobile laboratory with laboratory-grade certifiable instrumentation and procedures for real-time analysis of individual VOCs. Non-specific portable organic vapor analyzers and/or GC-based handheld detectors may not be used for analysis, except for daily or weekly vapor monitoring during SVE.

1.5
Maintain flexibility in the sampling plan such that field modifications (grid pattern density, location and depth) can be made as real-time evaluation of analytical test results occurs. Include in the work plan decision-making criteria for these adjustments and explain decisions in the report. Field decisions shall be made in consultation with Regional Board staff.

1.6
Re-sample at any sampling point if anomalous data (i.e., 2 to 3 orders of magnitude difference from surrounding samples) are obtained. Board staff may require additional points to resolve the spatial distribution of the contaminants within the interval in question.

2.0 Sample Collection

2.1
Obtain samples at an adequate depth (nominally 5 feet) below ground surface (bgs) to minimize potential dilution by ambient air.

2.2
Conduct a site-specific purge volume versus contaminant concentration test at the start of the initial soil gas survey and vapor monitoring well sampling. The purpose of the test is to purge ambient air in the sampling system with minimal disturbance of soil gas around the probe tip. Conduct this test based on soil type and where VOC concentrations are suspected to be highest. Describe specific method and equipment to determine optimal purge rates and volumes. Take into account the potential sorption of target compounds to the tubing and adjust the purge rate and time to achieve the optimal purge volume. Limit the sampling vacuum to collect proper samples. Optimum purge volume may be compound specific. "Lighter" early eluting VOCs, such as vinyl chloride, may reach their highest concentration with less purging than "heavier" late eluting VOCs like PCE. Therefore, optimize the purge volume for the compound(s) of greatest concern.

2.3
Explain the expected zone of influence for sample points, taking into consideration soil types, land cover, drive point construction and sample purge rate/time/volume. The vertical zone of influence for purging and sampling must not intersect the ground surface.

2.4
Discuss soil gas sample collection and handling procedures. Discuss the procedures to prevent collection of samples under partial vacuum and the methods to minimize equipment cross-contamination between sampling points.

2.5
Avoid making a pilot hole (e.g., using a slam bar) prior to inserting the probe rod, except to drill through asphalt or concrete. The process of making a pilot hole may promote vapor contaminant aeration and result in lower sample concentration.

2.6
Specify that the sampling equipment (e.g., gas tight syringe, sorbent trap) will not compromise the integrity of the samples. Tedlar bags may only be used for qualitative analysis.

2.7
Assure that the probe tip, probe and probe connectors have the same diameter to provide a good seal between the formation and the sampling assembly. If a space develops between the probe and the formation, as a result of probe advancement, seal (e.g., with bentonite) the area around the probe at the surface to minimize the potential for ambient air intrusion.

2.8
Some sampling systems (e.g., Geoprobe) utilize the probe rod as a conduit for the tubing that connects to the probe tip. Assure a tight fit between the tubing and probe tip to minimize potential for leakage and dilution of the sample.

2.9
Follow the sampling method specified in the soil gas consultant's standard operating procedure (SOP). Discuss with Board staff any deviations from the SOP before it is implemented in the field.

3.0 Laboratory Analysis of Soil Gas Samples

3.1 Primary Target Compounds

1. Carbon tetrachloride
2. Chloroethane
3. Chloroform
4. 1,1-Dichloroethane
5. 1,2-Dichloroethane
6. 1,1-Dichloroethene
7. cis-1,2-Dichloroethene
8. trans-1,2-Dichloroethene
9. Dichloromethane (methylene chloride)
10. Tetrachloroethene
11. 1,1,1,2-Tetrachloroethane
12. 1,1,2,2-Tetrachloroethane
13. 1,1,1-Trichloroethane
14. 1,1,2-Trichloroethane
15. Trichloroethene
16. Vinyl chloride
17. Benzene
18. Toluene
19. Ethylbenzene
20. Xylenes
21. Trichlorofluoromethane (Freon 11)
22. Dichlorodifluoromethane (Freon 12)
23. 1,1,2-Trichloro-trifluoroethane (Freon 113)

3.2 Other Target Compounds
Analyze for other VOCs (e.g., methyl ethyl ketone, methyl isobutyl ketone, ethylene dibromide, petroleum hydrocarbons, etc.) based upon site history and conditions.

3.3 Detection Limit (DL)
Attain a DL of not more than 1 µg/L for all target compounds. A higher DL is acceptable only for the compound(s) whose concentration exceeds the initial calibration range.

3.4 Detectors
Use the following detectors in appropriate combinations:

Electrolytic conductivity detector (ELCD) (e.g., Hall)
Photoionization detector (PID)

Flame ionization detector (FID)
Mass spectrometer (MS)
Electron capture detector (ECD)

3.5.0 Identification of Calibration Standards & Laboratory Control Sample (LCS)

3.5.1
Properly and clearly identify all calibration standards and LCS. The identification must agree with the data on record for the standards and LCS.

3.5.2
Prepare LCS from a second source standard that is totally independent from the standards used for the initial calibration. Second source means a different supplier (whenever possible) or a different lot from the same supplier.

3.6.0 GC Conditions

3.6.1
Use a type of column that can separate all the target compounds. Coelution of the target compounds is not acceptable unless the compounds are distinguished and quantified by two different types of detectors in

use at that time.

3.6.2
Analyze the initial calibration and daily mid-point calibration check standards, LCS, blank, and samples using the same GC conditions (i.e., detector, temperature program, etc.).

3.6.3
Use a GC run time that is long enough to identify and quantify all the target compounds.

3.7.0 Initial Calibration (Record in Table 1)

3.7.1
Perform an initial calibration:

1. for all 23 compounds listed in Section 3.1;
2. when the GC column type is changed;
3. when the GC operating conditions have changed;
4. when the daily mid-point calibration check cannot meet the requirement in Section 3.8.3; and
5. when specified by Regional Board staff based on the scope and nature of the investigation.

3.7.2
Include at least three different concentrations of the standard in the initial calibration, with the lowest one not exceeding 5 times the DL for each compound.

3.7.3
Calculate the response factor (RF) for each compound and calibration concentration prior to analyzing any site samples. Calculate the average RF for each compound. The percent relative standard deviation (%RSD) for each target compound must not exceed 20% except for the following compounds which must not exceed 30%:

Trichlorofluoromethane (Freon 11)
Dichlorodifluoromethane (Freon 12)
Trichlorotrifluoromethane (Freon 113)
Chloroethane
Vinyl chloride

3.7.4
Verify the true concentration of the standard solutions used with the LCS after each initial calibration. Conduct the verification using a LCS with a mid-point concentration within the initial calibration range. The LCS must include all the target compounds. The RF of each compound must be within ±15% difference from the initial calibration, except for freon 11, 12 and 113, chloroethane, and vinyl chloride which must be within ±25% difference from the initial calibration.

3.8.0 Daily Mid-point Calibration Check
(Record in Table 1)

3.8.1
Check the calibration using the calibration standard solution with a mid-point concentration within the linear range of the initial calibration before any sample is analyzed.

3.8.2
Include in the daily mid-point calibration check standard the following compounds and **every** compound expected or detected at the site:

1. 1,1-Dichloroethane
2. 1,2-Dichloroethane
3. 1,1-Dichloroethene
4. cis-1,2-Dichloroethene
5. trans-1,2-Dichloroethene
6. Tetrachloroethene
7. 1,1,1-Trichloroethane
8. 1,1,2-Trichloroethane
9. Trichloroethene
10. Benzene
11. Toluene
12. Xylenes

3.8.3
Assure that the RF of each compound (except for freons 11, 12 and 113, chloroethane, and vinyl chloride) is within ±15% difference from the initial calibration's average RF. The RF for freons 11, 12 and 113, chloroethane, and vinyl chloride must be within ±25%.

3.9.0 Blank

3.9.1
Analyze field blank(s) to detect any possible interference from ambient air.

3.9.2
Investigate and determine the source(s) and resolve any laboratory contamination problem prior to analyzing any samples if the blank shows a measurable amount (≥1 µg/L) of the target compound(s).

3.10.0 Sample Analysis

3.10.1
Assure that the requirements for initial calibration, daily mid-point check, blank, and LCS are met before any site samples are analyzed.

3.10.2
Analyze samples within 30 minutes after collection to

minimize VOC loss. Longer holding time may be allowed if the laboratory uses a special sampling equipment (e.g., sorbent trap, glass bulb) and demonstrates that the holding time can exceed 30 minutes with no decrease in results.

3.10.3
Assure that the concentrations of constituent(s) in a sample do not exceed 50% of the highest concentration in the calibration range. Reanalyze the sample using a smaller volume or dilution if the detected concentration exceed 50% of the highest concentration in the calibration range.

3.10.4
Attain DL of not more than 1 µg/L for all target compounds. If lesser sample volumes or dilutions are used to off-set possible high concentration of constituents in the initial run, use the initial run to calculate the results for constituents that are not affected by the high concentration so that DL of 1 µg/L for these compounds can be achieved.

3.10.5
Quantify sample results using the average RF from the most recent initial calibration.

3.10.6
Add surrogate compounds to all samples. Assure that the surrogate compound concentration is within the initial calibration range. Two to three different surrogate compounds [one aromatic hydrocarbon and two chlorinated compounds (early and middle eluting, except gases)] should be used to cover the different temperature programming range for each GC run.

3.10.7
Calculate the surrogate recovery for each GC run. Surrogate recovery must not exceed ±25% difference from the true concentration of the surrogate, as the sample result would be considered questionable and may be rejected by this Regional Board.

3.11.0 Compound Confirmation

3.11.1
Conduct compound confirmation by GC/MS whenever possible. Use second column confirmation with surrogate for compound confirmation if GC/MS is not used.

3.11.2
Add surrogate compounds to standards and site samples for second column confirmation to monitor the relative retention time (RRT) shift between GC runs. This is required for better compound identification when ELCD, PID, ECD, and FID are used for analysis.

3.11.3
Usually one sample is adequate and quantitation is not required for second column confirmation. Second column confirmation can be done with a different GC. The representative sample can be collected in Tedlar bag and confirmation can be done off site.

3.11.4
Second column confirmation is not necessary if the compounds present have been confirmed from previous soil gas investigations.

3.12.0 Samples with High Concentration

3.12.1
DL may be raised above 1 µg/L for compounds with high results (i.e., the limit as specified in Section 3.10.3) and those closely eluting compounds for which quantitation may be interfered by the high concentrations.

3.12.2
Quantify sample results according to Section 3.10.4 for analytes which are not affected by the high concentration compounds.

3.12.3
If high VOC concentration in an area is known from previous soil gas analysis, Sections 3.12.1 and 3.12.2 are not necessary when analyzing samples from the area in question.

3.12.4
When dilution with ambient air is used for samples with high results, dilute and analyze in duplicate each day at least one sample to verify the dilution procedure. Ambient air should be checked periodically during each day of analysis.

3.13.0 Shortened Analysis Time

3.13.1
Shorten the GC run time under the following conditions only:

1. The exact number and identification of compounds are known from previous soil and soil gas investigations; and

2. The consultant has been given permission by Regional Board staff to analyze only for specific compounds.

3.13.2
Meet the following requirements when shortening GC run-time:

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1. Regional Board staff must approved the shortened run time;

2. The compounds must not coelute;

3. Perform initial calibration and daily mid-point calibration check and analyze LCS and samples under the same conditions as the shorter GC run-time;

4. Quantitate using the average RF from the initial calibration utilizing the shorter run-time; and

5. Perform a normal run-time analysis whenever peaks are detected within retention time windows where coelution, as indicated by the calibration chromatograms, is likely.

3.14.0 Last GC Test Run Per Day of Analysis (Record in Table 1)

3.14.1
A LCS as the last GC run of the day is not mandatory, except under conditions in Section 3.14.2. Include the same compounds used in the daily mid-point calibration check analysis, as listed in Section 3.8.2. Attain RF for each compound within ±20% difference from the initial calibration's average RF, except for freons 11, 12, 113, chloroethane, and vinyl chloride which must be within ±30%.

3.14.2
Analyze a LCS at the detection limit concentration instead of the mid-point concentration if all samples from same day of analysis show non-detect (ND) results. The recovery for each compound must be at least 50%. If it is less than 50%, all the ND results of the samples become questionable.

3.15.0 On-site Evaluation Check Sample

3.15.1
Analyze on-site the evaluation check sample as part of the QA/QC procedures when presented with such a check sample by Regional Board staff. Provide preliminary results on-site.

3.15.2
If the results show that the soil gas consultant has problems with the analysis, all the results generated during the same day may be rejected. Correct all problems before any more samples are analyzed.

3.16.0 Site Inspection

3.16.1
Unannounced, on-site inspection by Regional Board staff is routine. Provide upon request hard copies of the complete laboratory data, including raw data for initial calibration, daily mid-point check, LCS and blank results. Failure to allow such inspection or to present these records or field data may result in rejection of all sample results.

3.16.2
The soil gas consultant must understand the instruments, analytical and QA/QC procedures and must be capable of responding to reasonable inquiries.

3.17.0 Recordkeeping in the Mobile Laboratory
Maintain the following records in the mobile laboratory:

1. A hard copy record of calibration standards and LCS with the following information:

   a. Date of receipt
   b. Name of supplier
   c. Lot number
   d. Date of preparation for intermediate standards (dilution from the stock or concentrated solution from supplier)
   e. ID number or other identification data
   f. Name of person who performed the dilution
   g. Volume of concentrated solution taken for dilution
   h. Final volume after dilution
   i. Calculated concentration after dilution

2. A hard copy of each initial calibration for each instrument used for the past few months.

3. The laboratory standard operating procedures.

4.0 Reporting of Soil Gas Sample Results and QA/QC Data (Record in Table 1 and 2)

4.1
Report all sample test results and QA/QC data using the reporting formats in Appendix A. Compounds may be listed by retention time or in alphabetical order. Include in the table of sample results all compounds in the analyte list. Report unidentified or tentatively identified peaks. Submit upon request all data in electronic format and raw data, including the chromatograms. Identify the source(s) of the contaminants detected in the investigation, as indicated by the data.

4.2
Report the following for all calibration standards, LCS and environmental samples:

1. Site name
2. Laboratory name
3. Date of analysis
4. Name of analyst
5. Instrument identification
6. Normal injection volume
7. Injection time
8. Any special analytical conditions/remark

4.3
Provide additional information, as specified, for different types of analyses. Tabulate and present in a clear legible format all information according to the following grouping:

1. Initial calibration

   a. Source of standard (**STD LOT ID NO.**)
   b. Detector for quantitation (**DETECTOR**)
   c. Retention time (**RT**)
   d. Standard mass or concentration (**MASS/CONC**)
   e. Peak area (**AREA**)
   f. Response factor (**RF**)
   g. Average response factor (**RF_{ave}**)
   h. Standard deviation (**SD_{n-1}**) of RF, i.e.,

$$\left[\sum_{i=1}^{n} (RF_{ave} - RF_i)^2 / (n-1)\right]^{1/2}$$

   n = number of points in initial calibration

   i. Percent relative standard deviation (**% RSD**), i.e., $(SD_{n-1} / RF_{ave}) \times 100$ (%)
   j. Acceptable range of %RSD (**ACC RGE**)

2. Daily calibration check sample

   a. Source of standard
   b. Detector
   c. Retention time (RT)
   d. Standard mass or concentration
   e. Peak area
   f. Response factor (RF)
   g. Percent difference between RF and RF_{ave} from initial calibration (**% DIFF**)
   h. Acceptable range of %DIFF (**ACC RGE**)

3. LCS. Same format as daily calibration

4. Environmental sample

   a. Sample identification
   b. Sampling depth
   c. Purge volume
   d. Vacuum pressure
   e. Sampling time
   f. Injection time
   g. Injection volume
   h. Dilution factor (or concentration factor if trap is used)
   i. Detector for quantitation
   j. Retention time (RT)
   k. Peak area
   l. Concentration in µg/L (**CONC**)
   m. Total number of peaks found by each detector
   n. Unidentified peaks and/or other analytical remarks

5. Surrogate and second column confirmation

   Mark RT and compound name on: a) second column chromatogram of standard and b) second column chromatogram of confirmation sample.

4.4
Discuss the method(s) to be used for data interpolation (contouring). Provide isoconcentration maps for each VOC detected, total chlorinated volatile organics, total aromatic hydrocarbons, and petroleum-based hydrocarbons for each sampling depth, as applicable. Provide cross-section(s) depicting the geology and changes in contaminant concentration with depth, as justified by the data.

5.0 Companion Soil Sampling

5.1
Discuss soil boring locations with Regional Board staff. Locate borings and sampling depths based on all available information including soil gas test results.

5.2
Conduct the soil sampling and analysis per this Regional Board's **Well Investigation Program General Requirements for Subsurface Investigations, Requirements for Subsurface Soil Investigation** and **Laboratory Requirements for Soil and Water Sample Analyses.**

6.0 Soil Vapor Monitoring Well/Vertical Profiling

Install soil vapor monitoring wells for vertical profiling in areas where significant VOC concentrations were identified during the vapor investigation. The objectives of vertical profiling are to: 1) assess the vertical distribution of VOCs in the vapor phase within the unsaturated zone, 2) determine the spatial pattern of vapor phase soil contamination at different depths within the unsaturated zone, 3) identify migration pathways at depth along which VOCs may have migrated from sources, and 4) serve as discrete monitoring points to evaluate the efficiency of a cleanup action. Soil vapor monitoring wells offer the opportunity to resample as many times as necessary to monitor soil vapor changes over time.

Address appropriate items in the following sections when conducting vertical profiling.

6.1
Install nested, cluster, and/or multi-port vapor monitoring wells to obtain discrete multi-depth soil vapor data in the unsaturated zone. Provide a schematic diagram of the well design and a cross-section of the site showing the major lithologic units and zones for vapor monitoring.

6.2
Collect undisturbed soil samples if fine-grained soils are encountered during drilling of the boring for the probes. Due to air-stripping effect, VOC analysis of soil samples is not acceptable if air drilling method is used. Refer to Section 5.2 for sampling and testing requirements.

6.3
Use all available information (e.g., geologic log, organic vapor concentration reading) to select appropriate depths for vapor monitoring. Install probes at depths with elevated vapor readings (headspace) and/or slightly above fine-grained soils which can retard the migration of VOCs. The deepest probe should be installed above the capillary fringe.

6.4
Consider installing nested vapor probes in the annular space of the groundwater monitoring well to serve as a dual-purpose well if both vapor and groundwater monitoring are required. This design saves costs by installing vapor and groundwater monitoring wells in a single borehole.

6.5
Use small-diameter (e.g., ≤¼-inch) continuous tubing attached from the vapor probe to the ground surface to minimize purge volume.

6.6
Design and construct the vapor wells to serve as long-term monitoring points to evaluate the efficiency of a cleanup action and soil vapor changes over time. Protect the tubing from being damaged or clogged by subsurface soil materials especially in deep installations (e.g., place inside a PVC casing) or consider using ½-inch PVC pipe in place of the tubing. If a tubing is used, consider attaching a weight at the probe tip and/or attaching the tubing onto a supporting pipe or rod to ensure that the probe tip remains in-place during installation.

Properly cap the top end of each tubing/pipe (e.g., control valve) and label each tubing/pipe with the correct sampling depth.

6.7
Attach the bottom-end of the tubing to an appropriate vapor probe (e.g., PVC screen, stainless steel wire screen, stainless steel probe, or brass elbow, etc). If a vacuum pump is used for purging and sampling, include a wire screen around the probe to prevent soil particles from blocking the probe's airways. Ensure that the connection between the tubing and the vapor probe is tight to prevent leakage.

6.8
Place the filter pack (e.g., sand or pea gravel) around each vapor probe and isolate each monitoring zone with bentonite seals. Use an appropriate method (e.g., tremie method) to avoid bridging or segregation during placement of the filter packs and bentonite seals.

Extend the filter pack to a sufficient distance above the probe to allow for settling of backfill materials. In general, the filter pack should not exceed 3 feet in thickness. In deep borings, the filter pack should extend about four feet above the probe to allow for settling of backfill materials and to reduce the potential for the bentonite seal settling around the probe.

Consider placing fine sand above the filter pack to prevent the bentonite seal from entering the filter pack. Place a minimum of two feet thick bentonite seal above and below the filter pack. Allow sufficient time (e.g., one-half to one hour) for bentonite seal to properly hydrate before placing filter pack or cement-based sealing materials.

6.9
Prevent infiltration of surface runoff and unauthorized access (e.g., use a locking subsurface utility vault).

6.10
Specify the schedule for sampling the vapor probes. In general, soil vapor monitoring is required a minimum of one and two months after installation. Due to the VOC stripping caused by air drilling methods, conduct soil vapor monitoring at least two and four months following well completion. Regional Board staff may require a different sampling schedule and additional sampling based upon site conditions and test results.

6.11
Specify the procedures to properly decommission vapor wells that are no longer needed. The decommissioning activity should achieve an effective and long-term seal of subsurface geologic materials and prevent cross contamination in the subsurface.

7.0 Soil Gas Consultants

This Regional Board reserves the authority to review any soil gas consultant's work to assure compliance with all applicable statutes, regulations, orders, and guidelines. It is your responsibility to ascertain that the individual directing the field investigation is professionally qualified and conducts the field work in accordance with the Board's guidance for active soil gas investigations.

Acknowledgements

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Table 1
SOIL GAS INITIAL CALIBRATION

SITE NAME: ______________________ LAB NAME: ____________________ DATE: __________

ANALYST: ______________ STD LOT ID NO.: ______________ INSTRUMENT ID: ______________
NORMAL INJECTION VOLUME: ______________________ INJECTION TIME: ____________________

COMPOUND	DETECTOR	1st CONC RT/RRT	1st CONC MASS/CONC	1st CONC AREA	1st CONC RF	2nd CONC RT	2nd CONC MASS/CONC	2nd CONC AREA	2nd CONC RF	3rd CONC RT/RRT	3rd CONC MASS/CONC	3rd CONC AREA	3rd CONC RF	RFave	SDn-1	%RSD	ACC RGE

-- OR --

COMPOUND	DETECTOR	RT/RRT	MASS/CONC	AREA	RF	RF_{ave}	SD_{n-1}	%RSD	ACC RGE
Compound 1		_______	1st conc	_______	_______				
		_______	2nd conc	_______	_______				
		_______	3rd conc	_______	_______				
Compound 2 (Surrogate)									

SOIL GAS DAILY MID-POINT CALIBRATION STANDARD

AND

SOIL GAS LABORATORY CONTROL SAMPLES (LCS)

SITE NAME: ______________________ LAB NAME: ____________________ DATE: __________

ANALYST: ______________ STD LOT ID NO.: ______________ INSTRUMENT ID: ______________
NORMAL INJECTION VOLUME: ______________________ INJECTION TIME: ____________________

COMPOUND (SURROGATE)	DETECTOR	RT/RRT	MASS/CONC	AREA	RF	%DIFF	ACC RGE

Table 2
SOIL GAS SAMPLE RESULTS

SITE NAME: ______________________ LAB NAME: ______________________ DATE: __________

ANALYST: ________________ COLLECTOR: ______________ INSTRUMENT ID: ____________
NORMAL INJECTION VOLUME: ____________________

Sample ID		Sample 1			Sample 2			Sample 3		
Sampling Depth										
Purge Volume										
Vacuum										
Sampling Time										
Injection Time										
Injection Volume										
Dilution Factor										
COMPOUND	DETECTOR	RT	AREA	CONC	RT	AREA	CONC	RT	AREA	CONC
Compound 1										
Compound 2										
Compound 3										
.										
.										
.										
.										
.										
Surrogate 1										
Surrogate 2										

Total Number of Peaks
by Detector 1 (specify)
by Detector 2 (specify)

Unidentified peaks and/or other analytical remarks

ALTERNATIVE FORMAT FOR REPORTING SOIL GAS SAMPLE RESULTS

SITE NAME: ____________ LAB NAME: ____________ DATE: ____________

Sample ID Sampling Depth	Sample 1	Sample 2	Sample 3 ...
COMPOUND	CONC	CONC	CONC
Compound 1			
Compound 2			
Compound 3			
.			
.			
.			
.			
.			
.			

(Page 1 of 2, Results Summary)

SITE NAME: ____________ LAB NAME: ______________ DATE: _______
ANALYST: ______________ COLLECTOR: ______ INSTRUMENT ID: ______
NORMAL INJECTION VOLUME: _____

Sample ID		Sample 1		Sample 2		Sample 3 ...	
Sampling Depth							
Purge Volume							
Vacuum							
Sampling Time							
Injection Time							
Injection Volume							
Dilution Factor							
COMPOUND	DETECTOR	RT	AREA	RT	AREA	RT	AREA
Compound 1							
Compound 2							
Compound 3							
.							
.							
.							
Surrogate 1							
Surrogate 2							
.							
.							

Total Number of Peaks
by Detector 1 (specify)
by Detector 2 (specify)

Unidentified peaks and/or other analytical remarks

(Page 2 of 2, Analytical Raw Data)

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HEALTH & SAFETY PLAN

GREVE FINANCIAL SERVICES, INC.
8915 SORENSEN AVENUE
SANTA FE SPRINGS, CALIFORNIA

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1. HEALTH AND SAFETY PLAN

Blakely Environmental Investigations, Inc. (BEII), has established this site-specific Health and Safety Plan (HASP) as part of he work plan for all individuals engaged in field assessment activities at the Greve Financial Services, Inc. (Greve) property located at 8915 Sorensen Avenue, Santa Fe Springs, CA. All site work shall be conducted in a safe manner and comply with EPA, state and local regulations, in particular OSHA 29 CFR, part 1910, the National Contingency Plan, and Title 8 of the Health and Safety Code. In addition, all site work will comply with BEII Corporate Health and Safety Program and all supporting Standard Operating Procedures. This HASP may be modified during actual field activities, if necessary, as more information and site-specific data is obtained.

Prior to any work on-site, an approved copy of this HASP (latest edition) shall be provided to all employees and subcontractors by the Project Manager. Each subcontractor will be responsible for providing their own HASP. At a minimum the subcontractors' HASP must meet the requirements of this HASP. BEII will review and approve each subcontractor HASP prior to initiation of field work.

1.1 PURPOSE AND OBJECTIVES

The purpose of this site-specific HASP is to provide guidelines and procedures to ensure the health and physical safety of those persons working at the Greve property. While it may be impossible to eliminate all risks associated with site work, the goal is to provide precautionary and responsive measures for the protection of on-site personnel, the general public and the environment.

The HASP objectives are as follows:

* Ensure the safety of all site personnel
* Protect the public and the environment
* Adhere to BEII Health and Safety procedures

1.2 IMPLEMENTATION

This site-specific HASP, and any additions included in a subcontractor HASP, will be reviewed and the Field Team Review Form (Attachment 1) will be completed by all site personnel prior to their scheduled field work. Whenever the site-specific HASP is revised or amended, personnel will be instructed in the new procedures and required to complete a new Field Team Review Form. The site-specific HASP will be implemented in the field by BEII's Health and Safety Coordinator and/or designated Site Safety Officer.

2.0 BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The site is located at 8915 Sorensen Avenue in Santa Fe Springs. The site was an operating chemical packaging facility. Petroleum hydrocarbon impacted soil and groundwater were identified at the site. Currently, the site is unoccupied.

2.2 SCOPE OF WORK

Perform a soil gas survey and advance ten borings.

3. RESPONSIBILITIES

3.1 HEALTH AND SAFETY COORDINATOR

As BEII's Health and Safety Coordinator (HSC), Dave Blakely is responsible for directing and implementing the HASP and ensuring that all BEII and subcontractor personnel have been trained in HASP procedures. The HSC will coordinate safety activities with subcontractors and serve as liaison with public officials who might wish to monitor health and safety activities on-site. The HSC will also ensure that proper protective equipment is available and used in the correct manner, that decontamination activities are carried out correctly, that specific site hazards are noted and accounted for in the Work Plan and that employees have knowledge of the local emergency medical system. The HSC may conduct periodic site audits to ensure compliance with the HASP and to note any additional hazards or concerns. The HSC has stop-work authorization, which shall be executed upon determination that an imminent health or safety hazard exists.

3.2 DESIGNATED SITE SAFETY OFFICER

As BEII's Site Safety Officer (SSO), James Jazmin is responsible for implementing the site-specific HASP in the absence of the HSC. The SSO shall conduct daily tailgate safety meetings and ensure that only authorized personnel are allowed at the site. In addition, the SSO shall ensure that the daily sign-in logs for site persons and visitors are maintained. The SSO shall report any unsafe acts or conditions to the HSC.

The SSO also has stop-work authorization, which shall be executed upon determination that an imminent danger to life or health exists. If a stop-work order is issued, due to safety concerns, the HSC shall be contacted immediately and appropriate steps taken to correct the situation.

3.3 PROJECT MANAGER

BEII Project Manager, Hiram Garcia is the direct link between BEII and the Greve. He is responsible for directing all on-site operations, including the overall implementation of the Health and Safety Program. In addition, the Project Manager is responsible for ensuring that adequate resources and personnel protective equipment are allocated for the health and safety of site personnel. The Project Manager is also responsible for ensuring that the safety personnel (via the HSC) are given free access to all relevant site information that could impact health and safety. He will correct conditions or work practices that could lead to employee exposure to hazardous materials.

3.4 OCCUPATIONAL MEDICAL CONSULTANT

SAN BERNARDINO COMMUNITY HOSPITAL, BEII's Occupational Medical Consultant, will be available to answer medical questions and provide guidance in unexpected situations. The Medical Consultant will recommend appropriate medical monitoring for the site team members.

3.5 EMPLOYEES

All BEII employees working at the site are responsible for reading and understanding the HASP. They will be held accountable for complying with all aspects of the HASP.

3.6 SUBCONTRACTORS

If they desire, subcontractors on the site may provide their own site Health and Safety Plan that must incorporate, at a minimum, BEII's Health and Safety Plan. As described above, BEII's HSC and SSO have authority to ensure that subcontractor employees are following the BEII and subcontractor HASP provisions.

4. EMERGENCY PLANNING

4.1 EMERGENCY SERVICES

Figure 1 illustrates the location of the Greve property with respect to the Hospital. If an emergency should occur on-site, the Emergency Medical System (911) should be activated.

4.2 EMERGENCY TELEPHONE NUMBERS

Emergency telephone numbers shall be posted on-site and made immediately available at all times. These numbers shall include the following:

EMERGENCY:	
Fire	(562) 944-9713
Ambulance	911
Police	(562) 409-1850
Emergency Rooms (see Figure 1 for Hospital Routes)	
Presbyterian Intercommunity Hospital	(562) 945-8925
San Bernardino Community Hospital	(909) 988-9211
BEII (Dave Blakely)	(760) 249-5498
Greve Financial Services, Inc. (Joe Kennedy)	(310) 753-5770

NON-EMERGENCY:

City Fire Department	(562) 944-9713
City Police Department	(562) 409-1850
U.S. Environmental Protection Agency	(202) 260-2090
Emergency Spill Response	911

5. HAZARD ASSESSMENT

This hazard assessment is based on available information concerning chemical hazards known or suspected to be present at the Greve property. The potential risks to site workers are evaluated below.

1. No danger exists from flammability or explosion since petroleum concentrations have been identified at less than 1% of the lower explosive limit of the most volatile constituent of the compound in the subsurface

2. No significant risk of inhalation of petroleum vapors exist due to the extremely low levels identified and the depth at which the concentrations were observed in the subsurface.

5.1 CHEMICAL EXPOSURE

Site workers may be exposed to the components of gasoline and chlorinated solvents during field activities, including drilling, sampling and treatment operations. Potential exposure is to petroleum hydrocarbon-contaminated soil and water. At present, the major expected site contaminants are 1,1,1 TCA, TCE, PCE, ethylbenzene, toluene and xylene. A description of some of these chemicals can be found in Table 1. The routes of exposure for hydrocarbons are ingestion, inhalation, skin absorption and eye or skin contact. Measures shall be taken to eliminate personnel exposure through the use of personal protection equipment when engineering controls are not feasible.

Table 1

Chemical Properties of Suspected Contaminants

Chemical Name	Chemical Formula Incompatibilities	CAS#	Description	LEL	UEL	(OSHA)	(OSHA)	(ACGIH)	(NIOSH)	(NIOSH)	IDLH	Carcinogen
Benzene	C_6H_6	71432	Clear colorless liquid with aro- mp:5.51N F bp: 176N F Flash p: 12NF	1.3 1.4%	7.1 8.0%	1 ppM	50 ppM (10 min)	1 ppM	.1 ppM (8 hrs)	1 ppM (15 min) CA	Yes	Strong oxidizers, chlorine,bromine
Toluene	C_7H_8	108883	Colorless liquid, benzoil like odor flammable mp: -95 to -94.5N, bp: 110.5N flash p: 40N Insol in H_2O	1.27%	7%	200 ppM	300 ppM 500 ppM (10 min. peak)	100ppM	100 ppM (10 hr)	200 ppM (10 min)	2,000 ppM	Strong oxidizers
Xylene	C_8H_{10}	1330207	Clear Liquid with aromatic colors. bp: 138.5N flash p: 81N F	1.1%	7%	100 ppM	---	---	100 ppM	200 ppM	1,000 ppM	Strong oxidizers
1,1,1 TCA	$C_2H_3Cl_3$	71-55-6	Colorless liquid, with a mild chloroform-like odor.	7.5%	12.5%	1,000 ppM	---	---	---	---	1,000ppM	Strong caustics, strong oxidizers

Table 1 (Continued)

Chemical Name	Rates of Exposure	Symptoms	Target Organs	Recommended Respirator Selection
Benzene	Inhalation Skin absorption Ingestion Skin/eye contact	Irritated eyes, nose respiratory system; giddy; headache; nausea; staggering gait; fatigue; anorexia; lassitude; dermatitis; bone marrow depressant; abdominal pain	Blood, CNS, skin, bone marrow, eyes, respiratory system	Pressure demand SCBA with full face piece at any detectable concentration
Toluene	Inhalation Skin absorption Ingestion Skin/eye contact	Fatigue; weakness; confusion; euphoria; dizziness; headache; diluted pupils; lacrimation; nervousness; muscle fatigue; insomnia; paresthesia; dermatitis; photophobia	CNS, liver kidneys, skin	Full face chemical cartridge respirator with organic vapor cartridge up to 1,000 ppM.
Xylene	Inhalation Skin absorption Ingestion	Dizziness; excitement; drowsiness; incoordination; staggering gait; irritated eyes, nose, throat; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; dermatitis	CNS, eyes, gastrointestinal tract, blood, liver, kidneys, skin	Full face chemical cartridge respirator with organic vapor cartridge up to 1,000 ppM
1,1,1-TCA	Inhalation Skin absorption Ingestion Skin/eye contact	Headache, lassitude, CNS depression, poor equilibrium, irritation to eyes, dermititis, cardiac arrhythmias	Skin, CNS, cardiovascular system, eyes	Full face chemical cartridge respirator with organic vapor cartridge up to 1,000 ppM

5.2 FIRE AND EXPLOSION

The risk of fire or explosion during site activities is present, though minimal. Toluene is considered flammable and is a known contaminant on-site. The lower explosive limits (LEL) for benzene, toluene and xylene are 1.3 to 1.4 percent, 1.2 percent and 1.1 percent, respectively. Their flash points are 12F, 40F and 81F, respectively.

For added security, smoking will not be allowed on the site except in a designated smoking area (to be determined). "No Smoking" signs will be prominently displayed at numerous locations. A portable combustible gas monitor may be utilized to monitor the LEL. All work will cease if the percent LEL reaches 20 percent.

5.3 OXYGEN DEFICIENCY

It is not expected that an oxygen-depleted atmosphere will be encountered during site activities. Whenever the risk of encountering an oxygen-depleted atmosphere does exist (confined space entry, for example), precautions will be taken to ensure the safety of all employees. Confined space entries are used only as a last resort, when all other means have been exhausted. BEII uses a special permit system for confined space entry, entailing additional employee training and atmospheric monitoring.

5.4 BIOLOGIC HAZARDS

It is not anticipated that poisonous plants or hazardous animals will be encountered during site activities.

5.5 SAFETY HAZARDS

Minimal safety hazards are expected onsite. All work will be performed during daylight hours and not within any structures located on-site to minimize the need for artificial illumination.

5.6 HEAT RELATED DISORDERS

Wearing personal protective equipment while conducting site operations puts the individual worker at considerable risk of developing heat-related disorders, collectively called heat stress. Heat emergencies fall into three categories: heat cramps, heat-exhaustion, and heatstroke (i.e., sunstroke). Without intervention and resolution of the problem, muscle cramps caused by loss of salt from heavy sweating can lead to heat-exhaustion (caused by dehydration) which can lead to heatstroke. Early symptoms include dizziness, fatigue, muscle cramps, nausea, profuse sweating, thirst, weakness, and lightheadedness. Later symptoms of heat-exhaustion include cool moist skin, dilated pupils, headache, pale skin, irrational behavior, nausea, vomitting, and unconsciousness. Symptoms of heatstroke are dry, hot, red skin, fever, dark urine, confusion, rapid slow breathing, rapid weak pulse, seizures, small pupils, unconsciousness. On-site personnel will stay hydrated. Mandatory water breaks will be taken every 30 minutes to avoid dehydration. Monitoring will be performed to avoid heat stress, using both oral temperatures and radial pulse rate for all workers engaging in heavy labor at ambient temperatures over 70° F.

5.7 NOISE

Excess exposure to noise above 85 decibels (dBa) is not anticipated during work at the Greve property, however, hearing protection will be mandatory. In general, excess noise is "suspected" when people standing next to each other are not audible to one another. A Hearing Conservation Program has been established by BEII and is in effect for all site locations.

5.8 ELECTRICAL HAZARDS

All electrical work, installation and wire capacities shall be in accordance with the provisions of the National electric Code. Power cords will be UL-listed heavy duty and include a grounding plug. All power cords and receptacles shall be inspected before use to ensure that the casings are not cracked, grounding prongs are attached and that there are not other visible defects. If any defects are found, the cord, receptacle or equipment shall be tagged and placed out of use until repaired or disposed of. During equipment maintenance activities, proper lockout procedures will be utilized.

In addition, all equipment used on-site including drill rigs or remediation systems will be a minimum distance of ten-feet from overhead high voltage lines.

6. HEALTH AND SAFETY TRAINING

This section describes the health and safety training requirements necessary for participating in field operations at the Greve property.

6.1 TRAINING REQUIREMENTS

BEII employees and subcontractors who enter the site will be trained to be able to recognize and understand the potential hazards to health and safety associated with the site operations. All BEII employees potentially exposed to hazardous substances will have participated in 40 hours of health and safety instruction and actual field experience under the direct supervision of a trained, experienced supervisor. The objectives of the health and safety training are:

* To make each team member aware of the potential hazards they may encounter;
* To provide the knowledge and skills necessary to perform the work with minimal risk to worker health and safety;
* To make workers aware of the purpose and limitations of safety equipment;
* To ensure that workers can safely avoid or escape from emergency situations.

6.2 ADDITIONAL TRAINING REQUIREMENTS

Workers exposed to special hazards during field operations at the Greve property shall receive additional training as determined by the Project Health and Safety Coordinator. On-site managers and supervisors shall receive all training required for employees whom they supervise, plus eight additional hours of specialized training on management and supervision of such operations. Prior work experience or training will be acceptable provided that it is equivalent to the training requirements specified above. Whenever employees are working on-site, at least one person will be currently certified in Standard First Aid/CPR training.

6.3 DAILY SAFETY MEETINGS

Site-specific "tailgate" safety briefings will be conducted daily by the SSO or his designee to discuss the day's operations, review any modifications to the HASP and ensure that site personnel have the necessary information to conduct their jobs safely. The Tailgate Safety Meeting Form (Attachment 2) will be completed during this briefing and signed by all personnel in attendance. All completed forms shall be maintained on-site. Upon completion of the project, all forms shall be forwarded to the project Health and Safety files.

6.4 TRAINING PROGRAM CONTENT

BEII's Health and Safety Training Program involves instruction, self-study and field exercises in the following areas:

* Science of Hazardous Materials: Chemical and physical properties of hazardous

materials.

* Toxicology: Dose response, routes of exposure, toxic effects and exposure limits.

* Industrial Hygiene: Selection and use of proper protective equipment and clothing to ensure minimal contact with contamination, along with the proper methods to decontaminate non-disposable equipment.

* Decontamination: The methods to don and doff protective equipment and clothing to ensure minimal contact with contamination, along with the proper methods, to decontaminate non-disposable equipment.

* Emergencies: Potential emergency situations, first aid, self-rescue techniques, emergency drills, Record keeping and investigation.

* BEII Procedures: All aspects of the BEII Health and Safety Program for Hazardous Waste Site Operations, site-specific HASP, the Corrective Action Plan, and company standard operating procedures regarding these areas:

* Names of personnel and alternates responsible for site safety and health;
* Known or suspected health and safety hazards;
* Proper use of personal protective equipment;
* Work Practices to minimize risks;
* Safe use of engineering controls and equipment;
* Medical surveillance requirements;
* Site control measures;
* Decontamination procedures.

7. MEDICAL SURVEILLANCE

7.1 GENERAL

A medical surveillance program has been instituted by BEII for all employees with potential exposure to hazardous substances. An initial medical examination is given upon initiation of employment, annually thereafter, and upon termination (if the employee has not had an examination within the last six months). In addition, baseline monitoring and job termination monitoring may be established to document exposure for project personnel. Subcontractors working with hazardous materials or in the site exclusion zones will be required to have their own company medical monitoring plan that meets BEII standards at a minimum.

7.2 EXAMINATIONS

Each team member must have a physical examination prior to working on-site to verify that he/she is physically able to use protective equipment (including respirators), work in hot or cold environments and have no predispositions to occupationally-induced disease. The medical program will also consist of periodic follow-up exams and additional exams as needed to evaluate specific exposures of unexplainable illnesses. The exams will be provided by the San Bernardino Community Hospital or an equally qualified alternate who is Board-certified in Occupational Medicine.

8. PERSONAL PROTECTIVE EQUIPMENT

This section details the level of personal protection to be used during field operations at the Greve property. Appropriate levels of protection have been determined for areas on-site through the information detailed in the site hazard assessment.

8.1 GENERAL

During all field operations, personnel shall wear hardhats, safety glasses, and steel toe safety boots. Any coveralls and work boots that are worn on-site should not be worn off-site.

8.2 LEVEL D OPERATIONS

Level D operations will include equipment operators and all site personnel except those working in areas which have been designated as posing a possible exposure hazard. Level D personnel will wear work coveralls and Nitrile gloves, and have in their possession an air purifying respirator (half or full-face) with organic vapor cartridges.

8.3 LEVEL C OPERATIONS

The use of Level C protection at the Greve property is not anticipated. Previous air monitoring on-site has identified no significant concentrations of benzene vapors with a photoiionization detector, which was identified in free product on groundwater at the site. Nevertheless, Level C protection shall be implemented in areas where task-specific air monitoring indicates that the action level of 1 ppm as benzene is reached. It is not anticipated that this level of air contamination will be present during remediation activities at the site. Level C protective clothing will consist of the general protective gear plus air purifying respirators with organic vapor cartridges. Dust filters may be worn over the respirators will be utilized by equipment operators while full-face respirators will be required of ground personnel. In addition, personnel will wear surgical inner gloves, Nitrile outer gloves, nuke booties and tyvek or saran-coated tyvek coveralls (depending on moisture or splash hazard).

An H-NU DL-101 photoionization detector (PID) will be used on-site to monitor the air quality. The PID will be calibrated with isobutylene for the detection of benzene. The action level for the use of air purifying respirators will be set at 1 ppm as benzene. The action level will be inputted into the PID in alarm mode. The PID will be within ten-feet of on-site personnel. The PID will continuously monitor the air quality and sound an alarm when action levels are exceeded. To further protect site workers from possible exposure, a rigorous cartridge exchange program will be enforced. Respirator cartridges will be changed daily. However, should the action level be exceeded for a two-hour period then cartridges will be changed out every four-hours. Organic vapor/acid gas cartridges will be used in all respirators. All personnel undergo annual respiratory protection training in January of each year.

8.4 LEVEL B OPERATIONS

The use of Level B protection at the Greve property is not anticipated. However, Level B protection shall be used when benzene air monitoring concentrations exceed 5 ppm. Level B shall consist of all personnel protective equipment described above in Level C operations with the substitution of a pressure demand SCBA with full face piece.

The above levels of protection will be utilized during initial field operations. Upon receiving data from air, soil and water sampling, these levels of protection will be re-evaluated to provide sufficient employee protection while maximizing productivity. A situation may be present in which Level C respiratory protection is utilized while Level D clothing is used. Criteria for downgrading personnel protective equipment during field activities will be laboratory results indicating no potential for exposure above the Threshold Limit Value (TLV) for any site contaminant.

9. SITE CONTROL

9.1 SITE SECURITY

No one will be allowed to enter a site work area unless they have been given permission to do so by the

Project Manager and the Site Safety Officer, and otherwise follow applicable portions of this HASP.

9.2 DECONTAMINATION PROCEDURES

In order to assure that contamination is controlled and not spread from the site, decontamination procedures will be employed for both equipment and personnel. All decontamination activity will be monitored to assure compliance with the procedures described below.

Decontamination of personnel and equipment will be required following the monitoring activities. Decontamination procedures will be developed for both equipment and personnel. A distinction will be made between personnel equipment and monitoring equipment for purposes of decontamination.

9.2.1 STANDARD DECONTAMINATION

All field personnel exiting from the site must pass through a personnel contamination reduction corridor (CRC). At a minimum, all personnel exiting the site will remove all protective clothing and wash their face and hands before entering lunch and break areas to eat, drink or smoke. All personnel will perform a field wash (as defined below) before leaving the site.

A temporary CRC will be established by spreading a waterproof ground sheet and using several tubs for personnel decontamination. The area will be established by the SSO in discussion with the HSC and BEII Project Manager.

On-site showering will not be required as part of the routine decontamination procedure. However, a shower will be taken at the end of the working day after returning from the site to complete the decontamination process before the next meal or retiring for the day.

Disposal equipment, including respirator cartridges, must be placed in heavy plastic bags or directly into 55-gallon drums for off-site disposal in an approved manner. Used decontamination solutions will also be stored in 55-gallon drums.

9.2.2 EMERGENCY DECONTAMINATION

In the event that a seriously injured person is suspected of being contaminated, the SSO or other site worker will wrap the injured individual in clean plastic sheeting to prevent contamination of the ambulance. Less severely injured individuals will have their protective clothing carefully cut off before transport to the hospital.

9.2.3 COVERALLS

If coveralls are sent off-site for cleaning, the cleaner establishment will be notified of any hazards prior to receiving the coveralls.

9.3 WATER AVAILABILITY

Potable water will be available on-site. In addition, there are readily accessible toilet facilities on-site for personnel use.

9.4 RECORD KEEPING

To assure HASP implementation, many site activities will be documented. These include maintenance of the HASP at the site; employee HASP sign-off; daily safety briefings; site sign-in log; emergency medical data sheets; health and safety log-notes (which include instrument calibration records, sampling data, monitoring results and incident reports); chemical safety data sheets; and other records identified in the HASP. All documents noted are subject to audit and review by the Project Health and Safety Coordinator and/or Certified Industrial Hygienist.

9.5 EMERGENCY RESPONSE PLAN

Emergency response procedures have been developed for extraordinary events that could occur during field operations. These events include accidents and/or injuries, chemical exposure, spills and fires.

In general, the following actions shall be implemented in the event of an emergency:

1. First aid or other appropriate initial action will be administered by those closest to the accident/event. **This assistance will be coordinated by the designated Site Safety Officer and will be conducted so that those rendering assistance are not placed in a situation of unacceptable risk.** The primary concern is to avoid placing a greater number of personnel in jeopardy.

2. The Project Manager, Field Supervisor and Health and Safety Coordinator will be notified immediately. They will in turn notify Greve Financial Services, Inc..

3. An Accident/Incident Report will be completed by the injured individual or witness and Site Supervisor. The Accident Report will then be forwarded to the Project Manager. Upon reviewing and commenting on the accident/incident, the form will be forwarded to the BEII Health and Safety Coordinator who in turn will investigate and make comments on the accident/incident. Any necessary changes to the operation will be made to prevent the same accident or near miss situation from occurring in the future.

9.5.1 ACCIDENTS AND INJURIES

The following response procedures should not be considered inflexible. Every accident presents a unique hazard that must be dealt with by trained personnel working in a calm, controlled manner. In the event of an accident/unusual event, the prime consideration is to provide the appropriate initial response to assist those in jeopardy without placing additional personnel at unnecessary risk.

9.5.1.1 ACCIDENT/INJURY IN CONTAMINATED AREA

If a person working in a contaminated area is physically injured, American Red Cross first aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the person can be moved, they will be taken to the edge of the site (on a stretcher, if needed) where contaminated clothing will be removed (if possible), emergency first aid administered and transportation to a local emergency medical facility awaited.

9.5.1.2 ACCIDENT/INJURY IN NON-CONTAMINATED AREA

For accidents/injuries in a non-contaminated hazardous area, the procedures above should be followed with the exception that the injured individual should not be moved and the removal of contaminated clothing would not be necessary.

9.5.2 CHEMICAL EXPOSURE

If the injury to the worker is chemical in nature (e.g., overexposure), the following first aid procedures are generally to be instituted as soon as possible.

9.5.2.1 EYE EXPOSURE

If contaminated solids or liquids get into the eyes, they will be washed immediately for 15 to 30 minutes at the emergency eyewash station using large amounts of water and lifting the lower and upper lids occasionally. Medical attention will be obtained immediately. (Use of contact lenses is not permitted in a designated Exclusion Zone).

9.5.2.2 SKIN EXPOSURE

If contaminated solid or liquid gets on the skin, the affected area will be promptly washed with soap or mild detergent and water. If contaminated solids or liquids penetrate through the clothing, clothing will be immediately removed and the skin washed with soap or mild detergent and water. Medical attention will be obtained if symptoms warrant.

9.5.2.3 INHALATION

If a person inhales a large volume of potentially toxic vapors, they will be moved to fresh air at once. If breathing has stopped, artificial respiration will be performed. The affected person will be kept warm and at rest. Medical attention will be obtained immediately.

9.5.2.4 INGESTION

If contaminated soil or liquid is swallowed, medical attention will be obtained immediately. Before first aid is given, the Poison control Center shall be called.

9.5.3 FIRES

Fire extinguisher will be available on-site in support areas and in all vehicles. Fire extinguisher will be 20 lb. ABC's rated. Personnel will be trained in the proper use of fire extinguisher, techniques for smothering fires and emergency evacuation procedures. All personnel will be instructed to summon the local Fire Department if a fire should occur.

9.5.3.1 SMALL FIRES

In the event of a small fire at the site, the following actions shall be taken:

1. Evacuate all unnecessary personnel from the area;
2. Attempt to extinguish fire using portable fire extinguisher or by smothering (personnel protective equipment may be required);
3. Request emergency response assistance (ambulance, local Fire Department, hospital, poison control center) as appropriate for any injuries or exposures to hazardous chemicals which occur during suppression of the fire;
4. Notify the BEII Project Manager and Health and Safety Coordinator;
5. Notify Greve Financial Services, Inc..

9.5.3.2 LARGE FIRES

In the event of a large fire, or small fire, which cannot be extinguished, the following actions shall be taken:

1. Evacuate all personnel from the area, preferably to an upwind location;

2. Notify the local Fire Department and other emergency response agencies;

3. Notify the BEII Project Manager and Health and Safety Coordinator;

4. Notify Greve Financial Services, Inc..

9.6 EMERGENCY FOLLOW-UP AND EVALUATION

The BEII Field Supervisor will notify the Project Manager and Health and Safety Coordinator as soon as possible after an emergency situation has been stabilized. The Project Manager will then notify Greve Financial Services, Inc., appropriate agencies and environmental contacts. If an individual is injures, an Accident/Incident Report will be filed with the HSC.

9.7 PROCEDURES FOR REPORTING TO FEDERAL, STATE, AND LOCAL AGENCIES

In all cases, the BEII Project Manager will be notified. He, in turn, will contact the client and any regulatory agencies.

9.8 EMERGENCY EVACUATION PROCEDURES

In the event of a site emergency, all workers at the site will be notified by the SSO or designee to stop work immediately and offer assistance. Those not needed for immediate assistance will decontaminate per normal procedures and leave the site.

9.9 GENERAL SAFE WORK PRACTICES

9.9.1 MINIMIZATION OF CONTAMINATION

Personnel and equipment used in the contaminated area should be minimized, consistent with effective site operations. Only absolutely required samples will be taken back to the laboratory. Contamination will be avoided wherever possible by not kneeling on contaminated ground, avoiding puddles where possible and using plastic drop cloths and equipment covers.

9.9.2 SAMPLING PROCEDURES

Standard operating procedures will minimize the risk of personnel exposure to hazardous materials during sampling, packaging and shipping, and minimize the risk of exposure of others to spilled or residual waste materials.

9.9.3 SAFETY EQUIPMENT

First aid kits and fire extinguishers will be available on-site whenever work is being performed. First aid kits will contain at a minimum the following equipment: large absorbent gauze, adhesive bandages, bandage compresses, gauze pads, eye dressing, scissors, tweezers, triangular bandages, antiseptic pads, first aid book, activated charcoal, syrup of ipecac, burn spray and roller badges. First aid kits will be portable.

9.9.4 FORBIDDEN ACTIVITIES

a. Eating drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials in any area designated as contaminated;

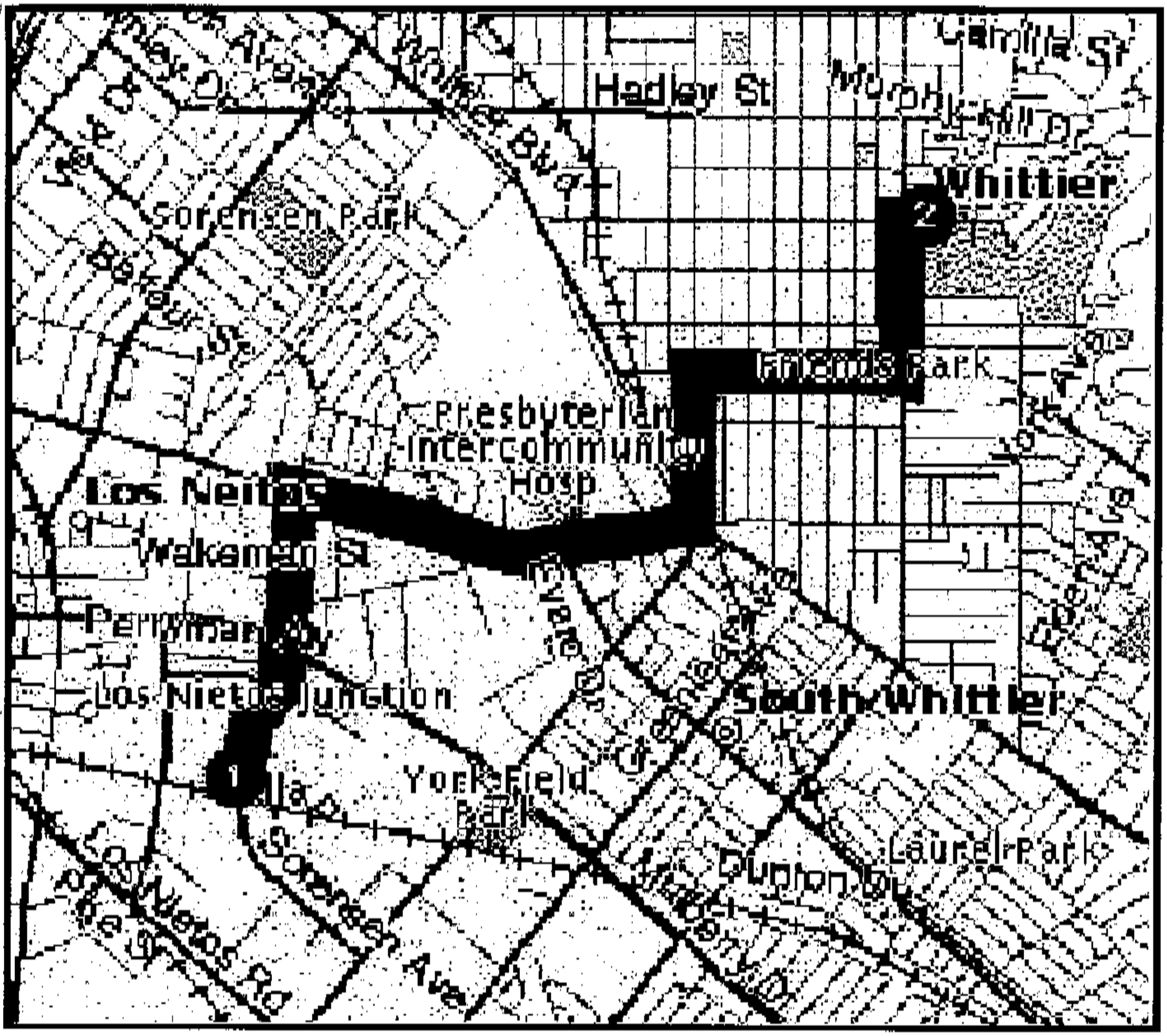
b. Ignition of flammable liquids or starting open flames;

c. Wearing contact lenses on-site;

d. Use of non-prescription controlled substances or alcohol on-site;

e. Site work at night.

Appropriate signs will be posted at the site.



Blakely Environmental Investigations, Inc. P.O. Box 339 Wrightwood, CA 92397	**Hospital Route** **Angeles Chemical Company** **8915 Sorensen Avenue** **Santa Fe Springs, CA**	**Figure 1**

ANINS000464

Field Team Review and Emergency Data

I have read and reviewed the most recent revision ____________________
Date

of the Health and Safety Plan (HASP) for the ____________________
Project

____________________. I understand the information contained therein and will
Site

comply with all aspects of the HASP.

Name: ______________________________

Signature: ______________________________

Date: ______________________________

This information is in case of emergency only:

Social Security #: ______________________________

Person(s) to notify in case of Emergency:

____

Relationship: ____

Daytime Phone #: ____

Name of Physician: ______________________ Phone #: ______________

Medical Coverage: ____

____

Employee Date of Birth: ______________________________________

*Known Allergies: ____

____

*Known Medical Conditions: ___________________________________

____

*any known allergies or medical conditions that physicians should be made aware of before medical attention is given (i.e. allergic to penicillin).

TAILGATE SAFETY MEETING

FACILITY

DATE TIME JOB #

CLIENT ADDRESS

SPECIFIC LOCATION

TYPE OF WORK

CHEMICALS USED

SAFETY TOPICS PRESENTED

PROTECTIVE CLOTHING/EQUIPMENT

CHEMICAL HAZARDS

PHYSICAL HAZARDS

EMERGENCY PROCEDURES

HOSPITAL PH# PARAMEDIC# 911

HOSPITAL ADDRESS (SEE ROUTE TO HOSPITAL MAP)

SPECIAL EQUIPMENT

OTHER

ATTENDEES

NAME	CO./ORG.	SIGNATURE

CONDUCTED BY:

BLAKELY ENVIRONMENTAL INV. INC. P.O.BOX 339 WRIGHTWOOD,CA 92397